ELECTRONICS AND COMMUNICATION ENGINEERING

5th Semester				6th Semester			
Subject Code	***Theory***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Theory***	***Contact Hrs L-T-P***	***Credit C***
MA 301 CY-301	Optimization in Engg OR Bio-Environmental Engg	3-0-0	3	CY-301 MA-301	Bio-Environmental Engg OR Optimization in Engg	3-0-0	3
EC-321 EE-321	Digital Signal Processing OR Power Electronics	3-0-0	3	EE-321 EC-321	Power Electronics OR Digital Signal Processing	3-0-0	3
IC-323 EC-333	Control System Engg OR Microprocessors & Microcontrollers	3-1-0 3-0-0	4 3	EC-333 IC-323	Microprocessors & Microcontrollers OR Control System Engg	3-0-0 3-1-0	3 4
EC-361	Electromagnetic Theory	3-1-0	4	EC-342	Digital Communication Techniques	3-1-0	4
EC-341	Analogue Communication Techniques	3-1-0	4	EL-I	Elective – I	3-0-0	3
		18/17	18/17			17/16	17/16
Subject Code	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***
EC-373 IC-373	Microprocessors & Microcontrollers Lab OR Instrumentation & Control Lab.	0-0-3	2	EC-373 IC-373	Microprocessors & Microcontrollers Lab OR Instrumentation & Control Lab	0-0-3	2
EC-375	Analogue Communication Lab	0-0-3	2	EC-372	Digital Communication Lab.	0-0-3	2
EE-371 EC-371	Power Electronics Lab OR Digital Signal Processing Lab	0-0-3	2	EC-371 EE-371	A Digital Signal Processing Lab. OR Power Electronics Lab	0-0-3	2
	Total	**9**	**6**		**Total**	**9**	**6**
	Grand Total	**27/26**	**24/23**		**Grand Total**	**26/25**	**23/22**

MA-301 OPTIMIZATION IN ENGINEERING (3-0-0)

MODULE-I (15 Hours)

Two variable LP model, Graphical sensitivity analysis, The Simplex method, Computational details, Simplex algorithm, Artificial Starting solution, Degeneracy, Alternative optima , unbounded solution. Duality and Sensitivity analysis, primal Dual relation, Transportation Model, Non-traditional transportation model, Assignment model, Humgarian method, Networks, Shortest route problem, Maximal flow method.

MODULE-II (13 Hours)

Integer linear programming, Illustration Branch & Bound Algorithm, Cutting-plane algorithm, Dynamics programming, Knapsack model, Decision analysis & Game Theory, Simulation modelling, Monte-Carlo simulation for discrete events.

MODULE-III (12 Hours)

Nonlinear programming, Unconstrained optimizations, unimodal function, Necessary & sufficient conditions, Newton Raphson method, constrained algorithm, Direct search method, gradient method.

TEXT BOOKS

1. H. A Taha, Operations Research: An Introduction, Pearson Education, (7^{th} Edition); Ch-2[2.1,2.2 (2.2.1, 2.2.2), 2.3], Ch-3[3.1, 3.3, (3.3.1, 3.3.2) 3.4, 3.5], Ch-4[4.1, 4.2, 4.4 (4.4.1), 4.5 (4.5.1, 4.5.2)], Ch-5[5.1, 5.3(5.3.1, 5.3.2), 5.4(5.4.1)], Ch-6[6.1, 6.3 (6.3.1, 6.3.2), 6.4 (6.4.1, 6.4.2)], Ch-9 [9.1, 9.2(9.2.1, 9.2.3)], Ch-10 [10.3.1 Ch-14 **:**14.3, 14.4], Ch-18 [18.1**,** 18.4], Ch-20[20.1(20.1.1), 20.2 (20.2.1, 20.2.2)], Ch-21[21.1]

REFERENCE BOOKS

1. F.S Hiller, G. J. Libermen, An Introduction to Operations Research: Concepts & Cases, (8^{th} Edition), TMH Publication.
2. Kalyanmayee Dev, Optimization for Engineering Design, PHI Publications

CY-301 BIO-ENVIRONMENTAL ENGINEERING (3-0-0)

MODULE –I (22 Hours)

Fundamentals of Ecology: Components and structures of Eco-system. Levels of organization in the biotic components of the Eco-system. Eco-system processes- Energy flow-primary and secondary production, tropic level, food chain & food web and Bio-magnification. Decomposition and Nutrient Cycling- Biogeochemical cycles of nature- Carbon cycle, Nitrogen cycle and Hydrological cycle.

Fundamentals of Chemistry and Microbiology : Water chemistry : Concentration expressions, mole concept and Stoichiometry. Physical & chemical properties of water. Organic chemical properties and their measurement, parameters like BOD, COD, and TOC & TOD Inorganic properties like pH, Alkalinity, Hardness, conductivity and Solubility. Atmospheric chemistry – structure of atmosphere, chemistry of primary and secondary air pollutants. Chemical Reaction- Chemical & Bio-chemical Reactions fundamentals of reaction kinetics, Reactor configurations and material balances.

Microbiology – Important microbes in Environmental Engineering, Microbial growth and decay rates, Aerobic & Anaerobic group of bacteria.

ENVIRONMENTAL POLLUTION

Water Pollution:- Water quality standard and parameter (Indian Standard Drinking Water Specifications, IS 10500, 1991), Physical, Chemical and Biological methods of assessment of water quality, Aquatic Pollution, Fresh Water Pollution:- Organic Pollution, Oxygen Sag Curve,

Eutrophication and Acidification, Estuarine water quality, Marine Pollution and Ground water pollution. Parameters of organic content of water quality, DO and BOD in streams, Deaeration and Reaeration kinetics in streams (Streeter – Phelps oxygen sag formula)

Air Pollution:- Primary and Secondary pollutants, units of concentration, Global air pollution-Acid rain , Global warming and ozone layer depletion. Air pollution meteorology – Ambient and Adiabatic lapse rate, Atmospheric stability Lapse rates and Dispersion, Atmospheric Dispersion. Noise Pollution: Sources of noise, Physical properties of sound, resultant and equivalent sound levels , Noise control measures and impact of noise on human health.

MODULE-II (14 Hours)

ENVIRONMENTAL POLLUTION CONTROL

Water Treatment:- Conventional water treatment comprising of Pre-treatment – Screenings, Aeration and Equalisation Primary Treatment – Sedimentation, Coagulation, Filtration Disinferction – Chlorination, Breakpoint chlorinatioin Advanced water treatment – Fluoridation, Deflouridation, Ion-Exchange and Reverse Osmosis.

Wastewater Treatment (Domestic waste water) : Wastewater flow and characteristics Pretreatment-Screenings, Grit chamber, Equalisation and storage. Primary treatment – Sedimentation and coagulation Biological treatment (Aerobic) Activated Sludge Process (ASP) with complete mix reactor and design parameters. Biological treatment (Anaerobic)

Municipal Solid Waste (MSW) : Physical, Chemical and Energy properties of MSW, MSW Management – Composting, MSW Management – Landfill Operations

Hazardous Waste Management: Characterization, Hazardous Waste Treatment – Incineration

Industrial Air Emission Control : Gaseous Emission Control – Absorption, Adsorption and Condensation, Particulate Emission Control – Gravity Settling Chamber, Cyclone Separator, Bag Filter and Electrostatic Precipitator, Flue gas desulpherisation, NO_x Emission Control and Fugitive Emission

MODULE-III (6 Hours)

ENVIRONMENTAL MANAGEMENT

Evolution of environmental legislation in India, Environment, Development and Sustainable Development, ISO 14,000- Environmental Management Systems – Life Cycle Assessment

Elements of waste minimization- strategy-Reduction at source, Recycling/Reuse/ Recovery, Waste treatment and Disposal, Waste minimization program, Cost benefit analysis and advantage of clean technology

Environmental Impact Assessment

Stages of EIA procedure – Screening, Scoping, Environmental Impact Statement (EIS), Public Participation and Review, Generic Structure of EIA report:- Project Profile, Baseline Data Collection, Impact Prediction and Assessment, Environmental Management Plan (EMP) and Post EMP Monitoring.

TEXT BOOKS

1. Gerard Kiely, Environmental Engineering, Tata McGraw Hill Publishing Company Limited
2. Peavy, Rowe and Tchobanoglous, Environmental Engineering, Tata McGraw Hill Company Ltd.1981,(International Edition).
3. C.S.Rao, Environmental Pollution Control Engg., Wiely Eastern Ltd, New Delhi,1999.

EC - 321 DIGITAL SIGNAL PROCESSING (3-0-0)

MODULE-I (12 Hours)

Introduction to Discrete Time Signals & Systems: Discrete time signals, Elementary examples , Classification, Discrete Time Systems, Block diagram representation , Classification, **Analysis of discrete time LTI System:** Response of LTI systems to arbitrary inputs (convolution sum), properties of convolution and the interconnection of LTI systems, causal LTI systems, stability of LTI systems, systems with finite- duration and infinite-duration Impulse response, Recursive and non-recursive discrete time systems, LTI systems characterized by constant coefficient Difference Equations, Solution of linear constant coefficient Difference equations, **Implementation of Discrete time systems:** Structures for the realization of LTI systems (Form I, Form II, Cascade, Parallel, Lattice), Recursive and Non-recursive realizations for FIR systems. **Correlation of Discrete time signals:** Cross correlation and auto correlation sequence, Properties of the autocorrelation and cross correlation sequence. **Z transform:** The Z-transform and one sided Z-transform properties of Z transform, Inversion of the Z-transform, solution of difference equations, causality and stability of LTI systems in the Z-domain.

MODULE-II (12 Hours)

Frequency analysis of Discrete time Signals: Energy density spectrum of aperiodic signals, Relationship of the Fourier Transform to the Z-transform, The spectrum, Fourier Transform of Signals with poles on the unit circle.

LTI Systems as Frequency-selective filters:- Lowpass, highpass, bandpass filters, Digital resonators, Notch filters, Comb filters, Allpass filters

Inverse systems and Deconvolution: Minimum phase, maximum phase and mixed phase systems, system identification and deconvolution, Homomorphic deconvolution.

The Discrete Fourier Transform: DFT and IDFT, DFT as a linear transformation, relationship of DFT with Z-transform, properties of the DFT, Circular convolution, circular correlation, filtering of long data sequences: overlap-add and overlap-save method.

MODULE-III (12 Hours)

Fast Fourier Transform: Direct computation of DFT, Radix-2 FFT algorithm, DIT and DIF FFT, Applications of FFT: efficient computation of DFT of two real sequences, efficient computation of DFT of a 2 N point real sequence.

Power Spectrum Estimation : computation of the Energy Density Spectrum, the Periodogram, DFT in power spectrum estimation, Bartlett method, Welch Method, Blackmann & Tookey method

Digital Filter: Causality and its implications, characteristics of practical frequency selective filter, FIR filter design using different windows (Rectangular, Hann, Hamming, Bartlet, Kaiser), FIR filter design using frequency sampling method, Design of IIR filters: Impulse invariant method, Bilinear transformation method.

TEXT BOOKS:

1. J.G. Proakis & D.G. Manolakis, Digital Signal Processing- Principles, Algorithms and Applications, Pearson.
2. Schilling & Harris, Fundamentals of Digital Signal Processing, Thomson Learning

REFERENCE BOOKS:

1. J.R. Johnson, Introduction to Digital Signal Processing, PHI
2. Sanjit K. Mitra, Digital Signal Processing : A Computer Based Approach, Tata McGraw Hill

EE 321 POWER ELECTRONICS (3-0-0)

MODULE-I (16 Hours)

Power Semiconductor Devices : Power Diodes : Types, characteristics

Thyristors : SCR, Static V-I characteristics of SCR, two transistor analogy of SCR, dynamic characteristics of SCR, Gate characteristics of SCR, Thyristor ratings, DIAC, TRIAC, GRO, UJT.

Power Transistors : Power BJT, Power MOSFETS, IGBT.

Triggering Circuits : R- Triggering, R-C Triggering, UJT triggering, Design of UJT triggering circuit, Cosine law triggering, triggering circuit using pulse train.

Thyristor commutation circuits : Class-A, Class-B, Class-C, Class-D, Calss-E, Class-F commutation circuits. Series and parallel operation of thyristors, protection of thyristors : di/dt protection, dv/dt protection, design of snubber circuit, overvoltage protection, over current protection.

MODULE-II (14 Hours)

Control rectifiers (AC to Dc converter) : Single phase converters : Principle of phase control, half wave controlled rectifier with R, R-L and R-L-E load, fully controlled bridge converter with R, R-L, R-L-E load. Effect of free wheeling diode, performance measures of two pulse converters. Half controlled (semi) converter. Effect of single phase full converter with source inductance. Dual converter. **Three phase converter :** 3-phase half wave controlled rectifier with R, and R-L load, 3-phase fully controlled bridge converter with R-L load (6-puse converter), 3-phase semi converter.

MODULE-III (10 Hours)

Inverter : Series inverter, parallel inverter, single phase bridge inverter. Mc-Murray inverter, Mc-Murray bed ford inverter, concept of VSI and CSI,3-phase bridge inverter (120^0 and 180^0 conduction mode), concept of PWM inverter.

D.C. Choppers : Principle of operation, control techniques, analysis of step down chopper with R-L-E load. Step up chopper, classification of choppers (Type A,B,C,D,E,) voltage commutated chopper, current commutated chopper, load commutated chopper.

Cyclo converters : Mid point-type and bridge type cyclo converter with R and R-L load.

Applications : HVDC transmission, UPS, Arc welding,. Zero voltage switch.

TEXT BOOKS :

1. Singh & Khanchandani, Power Electronics, TMH
2. P.S. Bhimbra,Power Electronics, Khanna Publication
3. M.H. Rashid,Power Electronics, Pearson Publication

REFERENCE BOOKS :

1. P.C. Sen , Power Electronics, TMH.
2. V.R. Murty, Power Electronics, Oxford Publication

IC-323 CONTROL SYSTEM ENGINEERING (3-1-0)

MODULE-I (10 Hours)

Introduction : Basic concepts of control systems, open loop and closed loop systems, difference between open loop and closed loop systems, classifications. Mathematical model of physical systems, transfer function, block diagram algebra, signal flow graph (SFG), Masoin's gain formula, application of SFG to control systems. **Feed back theory** : Types of feedbacks, effect of degenerative feedback on control systems, regenerative feedback. Components : A.C. Servo Motor, DC servo motor, synchros,

MODULE-II (10 Hours)

Time domain analysis : Standard test signals : Step, ramp, parabolic and impulse signals. Time response of 1st order systems to unit step and unit ramp inputs. Time response of 2^{nd} order to unit step input. Time response specifications. Steady state errors and error constants of different types of control systems Generalized error series method **Concepts of stability** : Necessary conditions of stability, Hurwitz stability criterion, routh stability criterion, application of routh stability criterion to linear feed back systems, relative stability.

MODULE-III (15 Hours)

Root locus techniques : Root locus concepts, rules for construction of root loci, determination of root locus, root contours. Frequency domain analysis: Introduction, bode plots, determination of stability from Bode plots, polar plots Nyquist stability criterion, Applications of nyquist to the liner feed back system. Closed loop frequency response: Constant M circles, constant N circles, use of Nicolas chart Controllers: Introduction proportional, derivative and integral control actions, P, PI and PID controllers.

TEXT BOOKS:

1. D.Roy Choudhury, Modern Control Engineering, PHI
2. K. Ogata, Modem Control Engineering, PHI
3. L.J. Nagrath, M. Gopal, Control Systems Engineering, Third Edition, New Age International Publishers. Reference Book

REFERNCE BOOKS

1. Samarjit Ghosh, Control System, Theory & Applications, Pearson Education
2. Eroni Umez Erani. System Dynamic and Control, PWS Publishing, International Thompson Publishing Company

EC-333 MICROPROCESSORS & MICROCONTROLLERS (3-0-0)

MODULE-I (12 Hours)

Microprocessor Architecture:- Introduction to Microprocessor and Microcomputer Architecture, Pins & Signals, Register Organization, Timing & Control MODULE, 8085 Instruction Timing & Execution. Instruction Set and Assembly Language Programming of 8085:- Instruction set of 8085, Memory & I/O Addressing, Assembly language programming using 8085 Instruction Set, use of Stack & Subroutines. Memory Interfacing:- Interfacing EPROM & RAM Memories Interrupts:-8085 Interrupts

MODULE-II (12 Hours)

Microprocessor Based System Development Aids:- Programmable Peripheral Interface: 8255, Programmable DMA Controller: 8257, Programmable Interrupt Controller: 8259, Microcontroller (Architecture and Programming):- Introduction to 8051 Microcontrollers (Architecture, Pin description), 8051 Assembly Language Programming (JUMP, LOOP, CALL Instructions), I/O Port Programming, 8051 Addressing Modes, Arithmetic & Logic Instructions, Microcontroller Interrupts and Interfacing to 8255:- 8051 Interrupts, Interfacing to 8255

MODULE-III (12 Hours)

Intel 8086 (16 bit processors):-8086 Architecture, Addressing Modes, Instruction Format, Pins & Signals, 8086 Basic System Concept, Interfacing with Memories, 8086 Interrupts.

Intel 80386 :- Introduction to 80386 Microprocessor, Architecture, Pins & Signals, Memory System, Registers, 80386 Memory Management, Paging Technique, Protected Mode Operation, brief introduction to 80387 Math Coprocessor. Pentium Processors (Only features):- Introduction to

Pentium Processors, Memory System, Input/Output System, Branch Prediction Logic, Floating Point MODULE, Cache Structure, Superscalar Architecture.

(only the features of Pentium Processor mentioned above are to be discussed)

TEXT BOOKS:

1. Ghosh & Sridhar, 0000 to 8085 -Introduction to Microprocessor for Scientists & Engineers, PHI publication (for MODULE I to MODULE-III)
2. A.K. Roy & K.M. Bhurchandi, Advanced Microprocessor and Peripherals (Architecture, Programming & Interfacing), TMH Publication (For MODULE-V to MODULE- VII)
3. Mazidi & Mazidi, The 8051 Microcontroller & Embedded Systems, Pearson / PHI publication (For MODULE-IV)

EC- 361 ELECTROMAGNETIC THEORY (3-1-0)

MODULE – I (16 Hours)

Review of the Co-ordinate Systems: Rectangular, Cylindrical, and Spherical Co-ordinate System. Co-ordinate transformation. Gradient of a Scalar field, Divergence of a Vector field and Curl of a Vector field. Their Physical interpretation. The Laplacian. Divergence Theorem, Stokes'Theorem. Useful Vector identities.

Electrostatics: The experimental laws of Coulomb, Electric field intensity. Field due to a line charge, Sheet Charge and Continuous Volume Charge distribution. Electric Flux and Flux Density; Gauss's law. Application of Gauss's law. Energy and Potential. The Potential Gradient. The Electric dipole. The Equipotential surfaces. Energy stored in an electrostatic field. Boundary Conditions. Capacitors and Capacitances. Poisson's and Laplace's equations. Solutions of Simple Boundary value problems. Method of Images.

Steady Electric Currents: Current densities, Resistance of a Conductor; The Equation of Continuity. Joules law. Boundary Conditions for Current densities. The EMF.

MODULE – II (16 Hours)

Magnetostatics: The Biot-Savart law. Amperes' Force Law. Torque exerted on a current carrying loop by a magnetic field. Gauss's law for magnetic fields. Magnetic Vector Potential. Magnetic Field Intensity and Ampere's Circuital law. Boundary conditions. Magnetic Materials .Energy in magnetic field . Magnetic circuits.

Faraday's Law of Induction: Self and Mutual inductance. Maxwell's Equations from Ampere's and Gauss's Laws. Maxwell's Equations in Differential and Integral forms; Equation of Continuity. Concept of Displacement Current. Electromagnetic Boundary Conditions. Poynting's Theorem , Time - Harmonic EM Fields . Application to Transformer.

Plane wave Propagation : Helmholtz wave Equation. Plane wave solution. Plane wave propagation in lossless and lossy dielectric medium and conducting medium. Plane wave in good conductor, surface resistance, depth of penetration. Polarization of EM wave - Linear, Circular and Elliptical polarization. Normal and Oblique incidence of linearly Polarized wave at the plane boundary of a perfect conductor, Dielectric - Dielectric Interface. Reflection and Transmission Co-efficient for parallel and perpendicular polarizations, Brewster angle.

MODULE – III (10 Hours)

Transmission lines: Lumped-Element Circuit model of a uniform transmission line. Wave solution. Propagation constant γ and characteristic impedance Z0. Losslas line. Sending end impedance. Reflection Co-efficient & VSWR for various terminating conditions. Length of transmission line as circuit elements. Field analysis of co-ax and two-wire transmission lines. R,L,C&G parameters.

Note to Instructor: The subject can be better mastered by solving problem. Please workout as many problems as possible in the class and through assignments.

TEXT BOOKS

1. E. C. Jordan & K. G. Balmin, Electromagnetic waves and Radiating Systems, 2nd Edition. PHI Pvt. Ltd.
2. B. S. Guru & Huseyn R. Hiziroglu. Electromagnetic Field Theory, Fundamental, Publication : Thomson Asia Pte. Ltd. Singapore. Vikas Publishing Home Pvt. Ltd. New Delhi.

REFERENCES

1. Mathew N. O. Sadiku, Elements of Electromagnetic, Publisher Oxford University Press.
2. Hayt & Buck, Engineering Electromagnetics , 7th Edition Tata McGraw Hill.
3. N. Narayan Rao, Elements of Engineering Electromagnetics – 6th Edition, Pearson Education.

EC-341 ANALOGUE COMMUNICATION TECHNIQUES (3-1-0)

MODULE I (14 Hours)

Spectral Analysis:

Fourier Series; the Sampling Function. The response of a linear systems. Normalized power in a fourier expansion. Impulse Response. Power Spectral Density. Effect of Transfer Function on Power Spectral Density. The Fourier Transform. Physical Appreciation of the Fourier Transform. Transform of some useful functions. Scaling, Time-shifting and Frequency shifting properties. Convolution, Parseval's Theorem. Correlation between waveforms; Auto-and cross correlation. Expansion in Orthogonal Functions. Correspondence between Signals and Vectors. Distinguishability of Signals.

Amplitude- Modulation Systems: A method of Frequency translation. Recovery of baseband Signal. Amplitude Modulation, Spectrum of AM Signal. The Balanced Modulator. The Square law Demodular. DSB-SC, SSB-SC and VSB-SC. Their Methods of Generation and Demodulation. Frequency Division Multiplexing.

MODULE II (12 Hours)

Frequency Modulation systems: Concept of Instantaneous Frequency. Generalized concept of Angle Modulation. Frequency modulation, Frequency Deviation, Spectrum of FM Signal with Sinusoidal Modulation. Bandwidth of FM Signal Narrowband and wideband FM. Bandwidth required for a Gaussian Modulated WBFM Signal. Generation of FM Signal. FM Demodulator. Carrier Acquisition phased locked loop. Pre-emphasis and De-emphasis Filters.

Mathematical Representation of Noise: Sources and Types of Noise. Frequency Domain Representation of Noise. Power Spectral Density. Spectral Components of Noise. Response of a Narrow band filter to noise. Effect of a Filter on the Power spectral density of noise. Superposition of Noises, Mixing involving noise. Linear filtering. Noise Bandwidth. Narrow band representation of noise and its PSD

MODULE III (10 Hours)

Noise in AM Systems: The AM Receiver, super heterodyne Principle, Calculation of Signal Power and Noise Power in SSB, DSB-SC and DSB FC. Figure of Merit, Square law Demodulation, The Envelope Demodulation, Threshold. **Noise in FM system:**Mathematical Representation of the operation of the Limiter Discriminator; Calculation of output SNR. Comparison of FM and AM. SNR Improvement using preemphasis.

Note Please workout as many problems as possible in class and through assignment.

TEXT BOOKS

1. Taub & Schilling, Principles of Communication Systems , 2nd Edition. Tata Me Graw Hill. Selected portion from Chapter 1,3, 4, 7, 8, 9 and 10.

REFERNCES

2. John Wiley & Sons, Communication Systems by Simon Haykin, 4th Edition, Inc.
3. B.P. Lathi, 3rd Edition, Modern Digital and Analogue Communication Systems, Oxford University Press. Selected Portion from Ch. 2,3,4,5 and 12.

EC - 342 DIGITAL COMMUNICATION TECHNIQUES (3-1-0)

MODULE-I (14 Hours)

Sampling Theorem: Signal Reconstruction, Practical Difficulties . The Treachery of Aliasing, The Anti-aliasing Filter; Discrete Fourier Transform , Natural & Flattop sampling. Signal recovery through holding.

Pulse Code Modulation : Quantization of Signals, Quantization error. Non-uniform Quantization. The Compander. The encoder, Transmission Bandwidth and output SNR. A TI Carrier System : Synchronizing and Signalling. Line coding Multiplexing T_1 lines – the T_2, T_3 & T_4 lines. Differential PCM. Delta Modulation. Adaptive Delta Modulation, Output SNR. Comparison with PCM.

Digital Modulation Techniques : Generation, Transmission, Reception, Spectrum and Geometrical Representation in the Signal Space of BPSK, DPSK, QPSK, $\pi/4$ QPSK, M-ary PSK, BFSK, and M-ary, FSK, and M-QASK.

MODULE – II (14 Hours)

Noise in PCM and DM : Calculation of Quantization Noise Power, Output Signal Power , and the Thermal Noise Power. Output SNR of PCM using different modulation techniques. Output SNR of DM .

Digital Data Transmission : A Baseband Signal Receiver. Peak Signal to RMS Noise output voltage Ratio, Probability of Error . The Optimum Filter. The Matched Filter- Probability of Error of the Matched Filter Coherent Reception . Calculation of P_e in case of PSK – Imperfect Phase – and imperfect bit synchronization, FSK and QPSK, use of signal space for calculation error probability 8in case of BFSK, BPSK and QPSK. Comparison of Modulation systems.

MODULE – III. (10 Hours)

Information Theory: The Concept of amount of Information, Average Information, Entropy; Shanon-Fano Algorithm. Shanon's Theorem – Channel Capacity, Bandwidth - S/ N Trade off.

Coding : Parity Check bit Coding for error Detection and correction. Hamming distance. Upper Bounds of probability of error with coding. Block codes - Coding and Decoding, Algebraic Codes: Hadamard Code, Hamming Code, Cyclic codes, Bursterror correction, Interleaving. Convolutional Coding : Code generation. Decoding of Convolutional Codes, State and Trellis diagram, Viterbi Algorithm.

TEXT BOOKS :

1. Taub & Schilling, Principles of Communication Systems, 2nd Edition. Tata Mc Graw Hill. Selected portion from Chapter 5,6,11,12, and 13.

REFERENCE BOOKS :

2. B.P. Lathi, Modern Digital and Analogue Communication Systems , 3rd Edition, Oxford University Press.
3. Simon Haykin, Communication Systems, 4th Edition, John Wiley & Sons, Inc.
4. Leon W. Couch-II, Digital and Analogue Communication System, 6th Edition, Pearson

ELECTIVE – I (Any One)

EC - 312	**PCB DESIGN**
EC - 362	**ANTENNA ENGINEERING**
EC - 364	**ELECTROMAGNETIC WAVE PROPAGATION**
CS - 401	**RELATIONAL DATABASE MANAGEMENT SYSTEMS**
EC - 302	**ADVANCED ELECTRONIC CIRCUITS**
CY - 201	**ENGGINERING MATERIALS**

EC – 312 PCB DESIGN (3-0-0)

MODULE – I [10 Hours]

Basics of Printed Circuit Boards: Components of a PCB, classification of PCBs, challenges in modern PCB Design & manufacture, major market drivers for the PCB industry, standards on PCBs.

Layout planning and Design: General PCB Design considerations, Mechanical design considerations, Electrical Design considerations, component placement rules, Environmental Factors, Cooling requirements & packaging density, layout design, layout design checklist, documentation.

MODULE –II [16 Hours]

PCB Fabrication process: PCB Technology trends, multi-layer boards, materials used in PCB, lamination processes, PCB soldering & Assembly techniques. **Design considerations for special circuits:** Design rules for Digital circuits, Analog circuits, High frequency circuits, fast pulse circuit & microwave circuits.

MODULE – III [6 Hours]

Artwork Generation: Basic approach to Manual Artwork, General Design guidelines for Artwork preparation, Artwork generation guidelines, Automated Artwork Generation, EDA tools for Schematic Capture, Circuit Simulation and Layout Design.

TEXT BOOKS:

1. Dr. R S Khandpur, Printed Circuit Boards Design, Fabrication, Assembly and Tesing-McGrawHill
2. Waller C. Bosshart, PCB Design & Technology, Tata McGraw Hill

REFERENCE BOOKS:

1. Clyde F Coombs, Printed Circuits Handbook, , McGraw Hill, ISBN-0071350160, 2001)

EC - 362 ANTENNA ENGINEERING (3-0-0)

MODULE -I (13 Hours)

Principles of Radiation, Retarded Vector Magnetic Potential. Radiation field from Current element. Radiation Resistance, Current Distribution, on a thin Wire. Half wave dipole and Quarter wave monopole. Two-element array. Principle of Pattern Multiplication. Linear Array. Broadside and end fire patterns. Antenna Gain, effective length of an antenna. Input Impedance. Balun. Folded Dipole, Yagi Antenna. Frequency Independent Antenna. Log Periodic Dipole array. Secondary Sources and Aperture Antennas. Magnetic Current. Principles of Images. The Equivalence Theorem. Radiation form Huygen's Sources. Radiation from open end of a Co-axial line. Aperture in an absorbing screen.

MODULE - II (13 Hours)

Radiation through an aperture in a perfectly conducting screen. Babinet's Principle-Complementary Screen. A thin slot in an infinite Screen. Slot antenna on a rectangular waveguide wall. Horn Antennas - Pyramidal & Sectoral Horn. Radiation Pattern and Gain of horn antenna.

Parabolic Reflector Antenna: Operation Principle, analysis, Radiation, Pattern and Gain. Principle of Cassegrain Antenna. Inducted EMF method of Calculating Input Impedance of wire antenna. Mutual Impedance between two dipoles.

MODULE - III (9 Hours)

Microstrip Antenna - Basic Characteristics, Rectangular Patch, Circular Patch, Microship Array Antenna. Electronic Scanning Antenna- Phase Scanning, Frequency Scanning and Beam switching. Antenna Measurements - Radiation Pattern, Gain and Input Impedance.

TEXT BOOKS

1. E. C Jordan and K. G. Balmain, Electromagnetic Wave and Radiating Systems , 2nd Edition, PHI. Ch.10,11,12,13,14 and 15.
2. C. Balanis, 2nd Edition, John Willey & Sons. Antennas Theory - Analysis and Design, Selected portion Ch.11,12,13, 15 and 16.

REFERENCES

1. J.D. Krauss. Antenna Engineering
2. R.E. Collins, Antennas and Wave Propagation

EC – 364 ELECTROMAGNETIC WAVE PROPAGATION (3-0-0)

MODULE-I (10 Hours)

Ground wave propagation : Plane earth Reflection; Space wave,; The surface waves; Elevated dipole antenna above a plane earth, wave tilt of surface wave; Spherical Earth Propagation. Tropospheric waves, Tropospheric scattering, Duct Propagation and non-standard Refraction.

MODULE-II (14 Hours)

Ionospheric Propagation : The making of the Ionosphere, ionospheric layers, medium parameters of ionosphere. Reflection and Refraction of waves by the ionosphere. Critical frequencies and virtual heights. MUF. Regular and irregular variation of ionosphere. Attenuation factor for ionospheric propagation. Sky wave calculation. Effects of the Earth's Magnetic field. Faraday Rotation and measurement of total electron content. Whistles and other ionospheric phenomena.

MODULE-III (08 Hours)

Microwave and mm wave Propagation: Attenuation by Ratin, Fog, Snow and Ice, and Atmospheric gases. Scattering by Rain, Effect of wave polarization.

Extremely low and very low freq. propagation.

TEXT BOOKS

1. E.C. Jordan and K.G. Balmain, Electromagnetic waves & Radiation Systems – 2nd Edition. PHI Ch. 16 & 17.
2. R.E. Collins, Antennas & Radiowave Progation, McGraw Hill Ch.6.

CS- 401 RELATIONAL DATABASE MANAGEMENT SYSTEM (3-0-0)

MODULE-I (15 Hours)

Introduction to Database: Characteristics of the Database approach, Advantages & Disadvantages of using DBMS approach. Database System Architecture: Data abstraction, Schema, Instances, Three Schema Architecture and data Independence, Types of Database users , DBA. Data base languages, Data Models: DML, DDL, DCL, Entity Relationship(ER), Relational mapping ER model to Relational Model, Object oriented data model , Object relational data model. Relational Query Language: Relational algebra, Tuple and Domain Relational Calculus and SQL.

MODULE-II (15 Hours)

Relational Database Design: Informal Design Guidelines for Relational schema. Relational database design: 1NF, concept of functional dependency, Relation keys, canonical cover, Decomposition of relational schemas, 2NF, 3NF, BCNF, Multivalued dependency. 4 NF, Query Processing and Optimization : Evaluation of Relational algebra Expression, Query Equivalence, Join Strategy, Query optimization algorithms.

MODULE-III (10 Hours)

Introduction to Transaction Processing: Transaction, Properties of Transaction, Serializability, Recoverability. Concurrency Control Techniques: Locking, Timestamp ordering, Multi version scheme , Storage Strategies: Indices, B Trees, Hashing, Database Recovery: Failure classification, Recovery and Atomicity, Log-based recovery and Check pointing, Introduction to advanced querying :Data mining and Data warehousing,

TEXT BOOKS

1. Ramez Elmasri and Shamkant Navathe: Fundamental of Database Systems. 4th Edition, Pearson Education.
2. Seilberschatz, H. Korth, S Sudharsan: Database System Concepts, MGH

REFERENCE BOOKS

1. C.J. Date, An Introduction to Database Systems, Pearson Education.
2. Bipin C. Desai, An Introduction to Database System, Galgotia publications

EC - 302 ADVANCED ELECTRONICS CIRCUITS (3-0-0)

MODULE -I (15 Hours)

Linear wave shaping:- The High pass and Low pass RC circuit- Exponential & Ramp input, Integrator, Differentiator, Attenuator

Bistable MV :- Stable states, fixed and self biasing transistor Binary, commutating capacitors, Triggering, Emitter coupled Binary- Schmit Trigger Circuit

Monostable MV:- Gate width of collector coupled mv, its waveform, effect of reverse saturation current on gate width, Analysis and waveform of emitter coupled monostable MV.

Astable MV:- Time period and waveforms of collector coupled multi, analysis of emitter coupled multi & its time period.

MODULE -II (10 Hours)

Negative Resistance Devices:- The behaviour and V~I characteristic of Tunnel Diode, UJT

Negative Resistance Switching Circuit:- Basic circuit principle for operation of voltage controllable and current controllable NR devices in Bistable, Monostable and Astable mode Application of Tunnel diode as Bistable, Monostable and Astable circuit **555 timer wave generator Analysis**, Application as Astable and monostable MV, sawtooth wave generator - using OP-AMP, using UJT

MODULE- III (10 Hours)

Voltage Time Base generator:- Method of generation-Exponential sweep circuit, NR switches, Miller and Bootstrap, Transistor Miller time base generator, Transistor Bootstrap time base generator.

Current time base generator:- A current sweep, linearity correction, Transistor current time base generator, methods of linearity improvement.

Sampling gate: Basic operating principle, unidirectional and Bidirectional diode gates.

The transistor as a chopper.

TEXT BOOKS

1. J. Millman, C. Halkias and S. Jit, , Electronics Devices and Circuits (2nd Edition), Tata Mc Graw Hill.
2. J. Milliman, H. Taub and P.Rao, Pulse, Digital and switching waveform, Tata Mc Graw Hill.

REFERENCE BOOKS

1. Ananda Kumar, Pulse and Digital Circuit, A, PHI
2. OP-Amp and linear Integrated circuit, R.F. Coughlin and F. Driscoll, Pearson Education.

CY – 201 ENGINEERING MATERIALS (3-0-0)

MODULE – I (16 Hours)

Fuel and combustion: Classification, calorific value, Solid fuels (Analysis of coal, manufacture of metallurgical coke),Liquid fuels (Refining of crude oil: fractional distillation, cracking, reforming, knocking, octane number and cetane number), Gaseous fuel (Producer gas, water gas, Biogas, LPG), Combustion calculations.

Water treatment : Hardness of water & its determination (EDTA method), Types of hardness, Disadvantages of hard water in boiler, Softening techniques (Soda lime, Zeolite and ion-exchange processes), Purification of Drinking water.

MODULE –II (12 Hours)

Inorganic Engineering Materials:

1. Glass: Manufacture of glass, Types.
2. Ceramics: White wares, glazing, optical fibres.
3. Refractories: Classification, manufacture of silica, fire clay and carborundum bricks.
4. Abrasives: Natural and artificial (carborundum, Alundum, Norbide).

Bio &Conducting polymers: Bio-polymers (Starch, Cellulose)**,** Conducting polymers (Polyacetylene, Polyaniline) Properties and application.

MODULE – III (14 Hours)

1. **Composites :** Constituents of Composites, Types of composites fibre - Reinforced composites, (Fiberglass, Advanced composites, wood) , Aggregate composites , mechanical properties of composites. Processing of composites.
2. **Chromatography :** Thin layer chromatography, Gas-liquid chromatography, Column chromatography, High Performance Liquid Chromatography (HPLC).

TEXT BOOKS

1. Jain & Jain, Engineering chemistry, 15th Edition, Dhanpat Rai Publishing Co., 2007.
2. Shackelford & Muralidhara:Introduction to Materials Science for Engineers, Sixth Edition 2007, Pearson Education.

SESSIONALS

(5th & 6th Semester)

EC 373 MICROPROCESSOR & MICROCONTROLLER LAB (0-0-3)

NOTE Total 10 (Ten) experiments have to be completed.

(2 from Gr – A , 4 from Gr – B , 2 from Gr – C, 2 from Gr – D)

A) 8085

1. Addition, Subtraction, Multiplication, Division of two 8 bit numbers resulting 8/16 bit numbers.
2. Smallest /Largest number among n numbers in a given data array
3. Binary to Gray Code / Hexadecimal to decimal conversion.

B) 8051MICROCONTROLLER

COMPULSORY

4. Initialize data to registers and memory using immediate, register , direct and indirect addressing mode

OPTIONAL (any one)

5. Addition, subtraction of 16 bit numbers.
6. Multiplication, Division of 16 bit numbers
7. Transfer a block of data to another memory location using indexing.

C) INTERFACING

COMPULSORY

8. Operation of 8255 using 8085 & 8051 microcontroller
9. Generate square waves on all lines of 8255 with different frequencies (concept of delay program)

OPTIONAL (Any Two)

10. Study of stepper Motor and its operations (Clockwise, anticlockwise, angular movement, rotate in various speeds)
11. Study of Elevator Simulator
12. Generation of Square, triangular and saw tooth wave using Digital to Analog Converter
13. Study of 8253 and its operation (Mode 0, Mode 2, Mode 3)
14. Study of Mode 0, Mode 1, BSR Mode operation of 8255.
15. Study of 8279 (keyboard & Display interface)
16. Study of 8259 Programmable Interrupt controller.
17. Study of Traffic Light controller

D) 8086

COMPULSORY

18. Addition, subtraction, Multiplication , Division of 16 bit nos + 2's complement of a 16 bit no.

OPTIONAL (Any One)

19. Marking of specific bit of a number using look-up table.
20. Largest /Smallest number of a given data array.
21. To separate the Odd and Even numbers from a given data array.
22. Sorting an array of numbers in ascending/descending order
23. Finding a particular data element in a given data array.

IC – 373 CONTROLS AND INSTRUMENTATION LAB (0-0-3)

LIST OF EXPERIMENTS

1) To plot the displacement - voltage characteristics of LVDT.
2) Find the frequency response of a lag and lead compensator.
3) Use of a strain gauge to plot the curve between strain applied to a beam and the output voltage.
4) Measurement of unknown capacitance using Schering bridge.
5) Study of resistance - voltage characteristics of RTD.
6) Study of Switches, Momentary keys, Dot graph indicator, Bar graph indicator and Light emitting diodes using Data Acquisition System.
7) Study of ADC, DAC and Bipolar ADC using Data Acquisition System.
8) Study of Optical, Proximity and Level transducers using Data Acquisition System.
9) Study of DC speed control system and determination of transfer function of permanent magnet DC motor.
10) Study of a DC position control system.
11) Study of Potentiometer
12) Measurement of unknown resistance with the help of Kelvin's Double Bridge
13) To observe the time response of second order processes with P, P+I, P+I+D Control and applied PID control to a DC Servo motor.
14) Study of stepper motor.
15) Study of two phase AC servo motor and its transfer function parameters.
16) To study the characteristics of a relay and analyze a relay control system (Phase plane).
17) To study of linear system simulator.

EC 375 ANALOGUE COMMUNICATION LABS (0-0-3)

(Minimum 10 experiments have to be performed.)

List of experiments

1. Study of communication channels and Noise.
   Objectives:
   a. Examine the operation of a Noise generator.
   b. Examine the operation of a Signal Attenuation Network.
   c. Measurement of S/N ratio. d. Measurement of Noise Figure.
2. To draw the Frequency Response curve for HPF, BPF, Band project filters and matched filters (LPF) and find the cut off frequency.
3. Study of AM modulation and Demodulation and to draw AM waveforms for various values of m and measurement of power in Sidebands, transmission Band Width.
4. Study of Sensitivity, Selectivity of a AM Radio receiver (Superheterodyne type).
5. Study of FM modulation using indirect method and demodulation using PLL detector and Ratio detector and calculate FM Bandwidth.

6. Study of SSB modulation.
   Objectives: a) To study operation of a modulator with suppressed carrier.
   b) To study SSB generation.
7. Study of pulse code modulation and Demodulation.
8. Study of Sampling and Reconstruction of Signal.
9. To generate various waveforms using MATLAB.
   i. Modulating wave
   ii. Carrier signal
   iii. DSB-FC,
   iv. DSB-SC.
10. To generate Gaussian Noise and study its effect on various AM waveforms using MATLAB.
   i. Modulating wave
   ii. Carrier signal.
   iii. DSB-FC
   iv. DSB-SC To Recover original signal by Filter.
11. Role of pre-emphasis and De-emphasis filters in FM generation and detection.
   Objective: To study how SNR is improved.

EE-371 POWER ELECTRONICS LAB (0-0-3)

1) Study of V-I characteristics of SCR.
2) Study of different methods of triggering of SCR.
   a) R-Triggering Method
   b) RC-Triggering Method
3) Study of different methods of triggering of SCR.
   a) UJT-Triggering method
   b) Cosine-Triggering method
4) Study of SCR Commutation Techniques
   Self Commutation (Class-A, Class-B)
5) Study of SCR Commutation Techniques
   Forced Commutation (Class-C, Class-D, Class-E)
6) Study of Single phase full wave fully controlled and semi controlled converter with R, R-L load with / without freewheeling diode.
7) Study of Three phase full wave fully controlled and semi controlled converter with R, R-L load with / without freewheeling diode.
8) Study of Single Phase AC voltage Controller Using Triac.
9) Study of DC Jones chopper with PWM controller.
10) Study of IGBT based 3-phase Voltage Source Inverter.
11) Study of Single phase Cyclo Converter.
12) Study of single phase Series Inverter.
13) Study of single phase Parallel Inverter.
14) Study of single phase Current Source Inverter.

EC -371 DIGITAL COMMUNICATION LABORATORY (0-0-3)

(Experiments under sl. No. 1-8 are mandatory; 9 and 10 should be attempted)

1. AD and DA Converters – Linearity.
2. 2 Level to N-Level Converter
3. Delta Modulator and Adaptive Delta Modulator
4. Generation of PSK, DPSK and QPSK Signal
5. Generation of FSK and MSK Signal
6. Generation of ASK and QAM Signals.
7. QPSK Demodulators.
8. Design of a PN sequence generator
9. PCM – TDM (MATLAB/Simulink Simulation)
10. Performance of any digital modulation / demodulation scheme in the presence of noise
11. (MATLAB Simulation).

7th Semester				8th Semester			
Subject Code	***Theory***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Theory***	***Contact Hrs L-T-P***	***Credit C***
EC-441	Communication Systems	3-0-0	3	HS-402	Principles of management	3-1-0	4
EI-423	VLSI Design	3-0-0	3	EC-442	Mobile Communication Engg	3-1-0	4
EC-461	Microwave Engg.	3-1-0	4	EL-IV	Elective – IV	3-0-0	3
EL-II	Elective – II	3-0-0	3	EL-V	Elective – V	3-0-0	3
EL-III	Elective – III	3-0-0	3				
	TOTAL	**17**	**17**		**TOTAL**	**13**	**13**
Subject Code	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***
EI-471	VLSI Lab	0-0-3	2	EC-492	Seminar	0-0-2	1
EC-473	Communication Systems Lab.	0-0-3	2				
EC-491	Seminar	0-0-2	1	EC-494	Major Project	0-0-10	7
EC-493	Minor Project	0-0-5	3	EC-496	Comprehensive Viva – Voce	0-0-3	2
EC-495	Summer Training		2				
	Total	**13**	**10**		**Total**	**15**	**10**
	Grand Total	**30**	**27**		**Grand Total**	**28**	**23**

EC – 441 COMMUNICATION SYSTEMS (3-0-0)

MODULE-I (18 Hours)

Optical Communication System : Major Elements of an optical fiber communication link. Windows for optical fiber communication. **Optical Fiber**: Refractive index profile of step Index and Graded Index Fibers. light ray propagation through Optical fiber. Total Internal Reflection. Numerical Aperture, Modal Concept. V number.

Fiber Materials: Fiber Fabrication: Concept of Preform. Double–Crucible Method. Cabling of Optical Fibers. **Signal Degradation in Optical Fiber:** Attenuation: Factors contributing to losses. Dispersions: Inter-and Intra Modal, Chromatic, Wave guide and Polarization Dispersions. Pulse Broadening in SI & GI fibers. Km - Bandwidth Concept.

Optical Sources: LED, Typical GaAlAs p-n junction double hetrostructure, Typical Spectral pattern, Modulation of an LED. Laser diodes: Principle of Operation. Typical Constructional features Radiation Pattern. Modulation of Laser diode. Power Lunching & Coupling : Source to fiber power launching , Coupling Power Calculation. Fiber-to-fiber Connectors Connector loss. Techniques of Splicing. Splicing loss. **Photo Detectors :** p-n , PIN and APD Photodetectors, Responsivity and Bandwidth of diodes. Noise in PDs. Equivalent Circuits. SNR.

Optical Receiver : Receiver Configuration Sensitivity and Bandwidth of Receiver Bit Error Rate. Design of Fiber Optic link : Time Budget and Power Budget . EDFA Amplifier.

MODULE-II (17 Hours)

Satellite Communication Systems

Orbital Mechanics: Determination of Orbinal Parameters, look angle of a geostationary Satellite from Earth. Launches and Launch Vehicle. Placing Satellite into Geo-stationary Orbit.

Satellite Subsystems : A brief Description of AOCS, TTC & M and Power System. Description of Communication System – Transponders. **Satellite Antennas:** Basic Antennas Types and Relationship; Global Beam Antenna, Satellite Antennas in Practice. Equipment Reliability & Space qualification. Redundancy. **Satellite Link Design :** Basic Transmission Theory , System Noise Temperature and G/T Ratio; G/T Ratio for Earth Station. Design of Down Link. Up link Design. Satellite Communication Link Design Procedure. System Design Example.

Multiple Access : Comprehensive study on FDMA, TDMA and CDMA. Spread Spectrum Transmission and Reception. **Propagation Effects and Their Impact:** Earth Links: Attenuation, Depolarization, Ionospheric & Troposhric effects. Prediction of Rain Attenuation. Propagation Impairement Countermeasures. Typical features of VSAT and Direct Broadcast Satellite TV & Radio System.

TEXT BOOKS

1. D. K. Mynbaev & Lowell L. Scheiner , Fiber Optic Communications Technology, Pearson Education.
2. T. Pratt, C. Bostian and J. Allnutt., Satellite Communication, 2nd Edition , Joihn Wiley Co. Selected Portion from Chapters 2,3,4,6,8,9 and 11.

REFERENCE BOOKS

1. John M. Senior, Optical Fiber Communication – Principle & Practice – 2nd Edition, Pearson Edition.
2. Robert M. Gagliardi, Satellite Communication, CBS Publishers
3. Harlod Kolimbins, Digital Communication with Satellite and Fiber Optic Application, PHI

EI–423 VLSI DESIGN (3-0-0)

MODULE – I (10 hours)

Introduction: Historical evolution of VLSI, Moore's Law, VLSI Design Methodologies, Front end design and Back end design

VLSI Fabrication: Fabrication processes, NMOS Fabrication, CMOS Fabrication, CMOS N-well process, Layout Design Rules, Stick Diagrams, Mask Layout Design

MOS Transistor: Review of structure and operation of MOSFET, NMOS, CMOS, MOSFET V-I characteristics, MOSFET capacitances, Short channel effects, MOSFET scaling, Modeling of MOSFET Transistors – Basic concept of SPICE level-1, level-2 and level-3 model equations.

MODULE – II (12 hours)

MOS Inverters: Basic MOS inverters and their characteristics, inverters with resistive load and with n-type MOSFET load, CMOS inverter Switching characteristics and interconnect effects, Delay time definition and calculations, inverter design with delay constraints, estimation of parasitics, switching power dissipation of CMOS inverters

Combinational MOS Logic Circuits: CMOS logic, complex logic circuits, pass transistor and transmission gate logic, sequential logic circuit: SR latch, clocked & flip-flop circuits, CMOS D latch and edge triggered flip-flop.

MODULE – III (12 Hours)

Dynamic Logic Circuits: Dynamic logic, basic principles, high performance dynamic logic circuits, Memories: ROM, Dynamic RAM, SRAM, flash memory

VHDL: Introduction, Behavioral Modeling, Sequential processing, Data Types, Sub program & Packages, Attributes, Configurations, VHDL design of adders, Multiplexer, Decoder, Latch, S-R flip flop, D flip flop, Memory circuits, Front end e-CAD tools

VLSI eCAD: VLSI Design methodology, Full custom, Semi-custom and Programmable designs, VLSI Design Flow, FPGA based designs, standard cell based designs, floor planning and place and route, Back end e-CAD tools

Design Verification and Testing: simulation at various levels including timing verification, fault models, Design strategies for testing chip level and system level test techniques.

TEXT BOOKS

1. Kang and Yussuf Leblebici, CMOS Digital Integrated Circuits – Analysis & Design, Sung Mo, Tata McGraw Hill.
2. D.L.Perry, VHDL Programming by examples, Tata McGraw Hill

REFERENCE BOOKS

1. J.M.Rabey, Anantha Chandrakasan and Borivoje Nikolic, Digital Integrated Circuits: A Design Perspective , Pearson Education.
2. Geiger et al., VLSI Design Techniques for Analog and Digital Circuits, McGraw Hill

EC – 461 MICROWAVE ENGINEERING (3-1-0)

MODULE – I (16 Hours)

High Frequency Transmission lines: Quarterwave impedance transformer and its frequency response. Transmission line as circuit element. The Smith Chart. Solution of Transmission line problems. Single Stub and Double Stub matching. Low loss line. Impedance Transformers.(All transmission line problems should be solved using smith chart)

Waveguides: General solutions for TEM, TE and TM waves. Rectangular waveguide: Field solution for TE and TM modes, Field patterns, power flow through waveguide. Attenuation due to conductor and dielectric losses. Design of Rectangular waveguide to support Dominant TE10 only. Co-axial line: TEM modes, Design of Co-axial lines. Cylindrical wave guide. Field patterns of dominant and higher order modes.

Microwave Resonator: Rectangular and Cylindrical wave guide Cavities. Resonant frequencies supporting, Dominant mode only. Design of Cylindrical wave guide cavity.

MODULE II (12 Hours)

Microwave Passive Components: Scattering matrix representation of 3-port and 4 port networks. Power dividers and Directional couplers: Simple analysis. Design 2-hole and multi-hole directional couplers. Principle of working of a waveguide hybrid junction (Magic-Tee) Principle of operation of attenuators, ferrite Isolators and circulators.

Microwave Sources: D.C. Circuit of Reflex Klystron: Velocity Modulation. Simple Analysis for electronic admittance. Modes of operation, Power output and frequency Vrs. Reflector Voltage. Performance Characteristics & Specification sheet.

TWT: Constructional features, D.C. Circuit, Principle of operation, Performance & specification sheet. Operational Principle of Magnetron and GaAs Diode.

MODULE – III

Microwave Antennas: Horn Antennas and Parabolic Reflector Antennas: Principle of Operation, Simple Analysis. Equation for Gain, Directivity, Radiation Pattern & Half-Power Beam widths. Solution of Simple problems. Applications.

Microwave Measurement: Microwave Bench, measurement of unknown Impedance / Admittance Measurement of Radiation Patterns and gain of a horn antenna.

Description of a Microwave Terrestrial Link

TEXT BOOKS

1. D.M. Pozar, Microwave Engineering, 2nd Edition, John Willy & Sons. Selected portions from Chapters 2, 3, 4, 6, 7 & 9.
2. Samuel Y., Liao, Microwave Device and Circuit, 3rd Edition, Pearson Publishing Home. Selected portion from Chapter 3,4,9 and 10.
3. G S N Raju, Antenna and wave propagation, Pearson's. Selected portion from Chapter 7 & 8.

REFERENCE BOOKS

1. Peter A. Rizzi, Microwave Engineering, PHI
2. R.E. Collins, Foundation of Microwave Engineering , Tata-McGraw Hill.

ELECTIVE – II & III (Any Two)

EC - 443 INFORMATION THEORY & CODING

EC - 413 OPTO ELECTRONICS & PHOTONICS

EC - 425 BIOMEDICAL SIGNAL PROCESS

EC - 421 DIGITAL IMAGE PROCESSING

EC - 423 DIGITAL SPEECH PROCESSING

CS - 301 OPERATING SYSTEM

CS - 428 COMPUTER ARCHITECTURE & ORGANISATION

CS - 421 SOFTWARE ENGINEERING

EC - 445 COMPUTER COMMUNICATION NETWORKS

EC - 451 NEURAL NETWORKS & APPLICATIONS

IC - 324 ADVANCED CONTROL SYSTEM ENGINEERING

EC - 452 SOFT COMPUTING

IT - 411 INTERNET & WEB TECHNOLOGY

CS - 416 BIOINFORMATICS

EC - 463 MICROWAVE COMMUNICATION SYSTEM.

EI- 425 EMBEDDED SYSTEM DESIGN

IT - 401 ESSENTIAL OF IT

CS - 306 MANAGEMENT INFORMATION SYSTEM

EC - 443 INFORMATION THEORY & CODING (3–0–0)

MODULE-I (10 Hours)

The concept of Amount of Information, Average Information, Entropy, Information rate,

Source Coding: Mathematical Model for information sources, Measure of information, Entropy. Coding for discrete memories sources, The Lempel – Ziv Algorithm

Channel Capacity and Coding: Channel Models, Channel Capacity, Achieving Channel Capacity with orthogonal signal channel reliability functions. Shannon's Theorem, Capacity of a Gaussian Channel, Bandwidth- S/N Trade-off.

MODULE-II (12 Hours)

Error Control Coding: Introduction, Forward & Backward error Correction, Hamming Weight and Hamming Distance, Linear Block Codes: Encoding and decoding of Linear Block-codes, Parity Check Matrix, Syndrome Decoding, Hamming Codes. Optimum Soft decision. Decoding of linear block codes. Hard decision decoding. Comparison of performance between Soft-decision and Hard-decision Decoding. Cyclic Codes: Introduction, Method for generating Cyclic Codes, Matrix description of Cyclic codes, Burst error correction, Cyclic redundancy check (CRC) codes, Circuit implementation of cyclic codes. Interleaving.

MODULE-III (10 Hours)

Convolutional Codes: Transfer Function. Optimum decoding of convolutional codes – The Viterbi Algorithm.

Probability of Error: Soft-decision decoding, Hard-decision decoding. Distance preparation of Binary Convolutional codes. Punctured Convolutional codes. Turbo Codes, Turbo Encoder and Decoder.

Cryptography: Public & Private key Encryption/Description, AES and DES standards.

TEXT BOOKS

1. J. G. Proakis, Digital Communications4th Edition, McGraw-Hill, (2001), Chapter 3, 7 and 8.
2. R. Bose, Information Theory and applications, 2nd Edition, TMH, (2008)

REFERENCE BOOKS

1. Simon Haykins, Communication Systems, 4th edition, Willey.

EC – 413 OPTO ELECTRONICS AND PHOTONICS (3-0-0)

MODULE-I (12 Hours)

Optical Processes in Semiconductors; Electron-hole pair formation and Recombination. Absorption in semiconductors. Effect of Electric field on absorption. The Kramer – Kronig Relation. Radiation in Semiconductors. Luminescence from Quantum wells. Time-Resolved Photoluminescence. P-N Junction; Semiconductor Hetero Junctions; Light Emitting Diodes: The Electroluminescence process. Choice of LED Materials. Device Configuration and efficiency, Light output from LED. Device Performance, Frequency response and Modulation bandwidth.

MODULE-II (12 Hours)

Lasers: Operating Principles, Emission, absorption and radiation in 2-level systems. The Einstein Relations and Population inversion. Lasing conditions and gain in a semiconductor. Selective Amplification and coherence – need for Laser Cavity. Lasing Threshold condition

Distributed feedback laser. Quantum well lasers. Measurement of Laser Characteristics.

Photo detectors: Gain & Bandwidth. Junction Photo detectors. PIN and APD Photo detectors. Noise performance.

MODULE-III (12 Hours)

Optical Amplifiers: Solid State Optical Amplifiers, Erbium doped Fiber Amplifier

Solar Cells Basic Principles: Current – Voltage Character Spectral Response. Hetero junction and cascaded solar cells. Schottkey Barrier cells. Materials and design considerations: Materials requirements.

Solar Cell Design. P^t–n–n^+ Vrs n^+–p–p^+ cells.

Dependence of Cell performance on External Factors.

TEXT BOOKS

1. Pallab Bhattacharya, Semiconductor Optoelectronic Devices,. PHI
2. D.K. Mynbaev and L.L. Scheiner , Fiber-optic Communication Technology,. Pearson Publication. Selected Portions.

REFERENCE BOOKS

1. A. Yariv and Pochi Yeh, Photonics – 6th Edition , Oxford Publication Optical Fiber Communication, 3rd Edition by Gerd Keiser, McGraw Hill International Edition.

EC - 425 BIOMEDICAL SIGNAL PROCESSING (3-0-0)

MODULE-I

Introduction to Biomedical Signals: The nature of biomedical signals, The action potential, objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, computer aided diagnosis.

Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis, Linear prediction theory, The Autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, Transient detection and elimination- The case of epileptic patients, overall performance.

MODULE-II

Sleep EEG: Data acquisition and classification of sleep stages, Adaptive Interference/Noise Cancellation: The steepest-descent algorithm, the Widrow-Hoff least mean square adaptive algorithm, Adaptive noise canceller, Cancellation of 60Hz interference in ECG, Canceling Donor-heart interference in Heart-transplant electrocardiography, Cancellation of ECG signal from the electrical activity of the chest muscles, Canceling of maternal ECG in fetal ECG, Cancellation of High frequency noise in Electro-surgery.

MODULE-III

Cardiological Signal Processing: Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, The use of multi-scale analysis for parameter estimation of ECG waveforms.

Prony's Method: Exponential modeling, Exponential parameter estimation, The original Prony problem, Least squares prony method, The covariance method of linear prediction, Prony's method in the presence of noise, clinical application of prony's method.

TEXT BOOKS:

1. D. C. Reddy, Biomedical Signal Processing Principles and Techniques, Tata McGraw-Hill, 2005.
2. Rangaraj M. Rangayyan, John Wiley, Biomedical Signal Analysis A case study approach, 2002.

REFERENCE BOOK:

1. Willis J. Tompkins, Biomedical Digital Signal Processing , Prentice Hall of India publications/ Eastern Economy Edition, 2nd Print, 2000.

EC – 421 DIGITAL IMAGE PROCESSING (3-0-0)

MODULE-I

INTRODUCTION: Fundamental steps in Digital Image Processing, Components of an image processing system, DIGITAL IMAGE FUNDAMENTALS: Image sampling and quantization, Some basic relationships between pixels, Linear and nonlinear operations, IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Some basic gray level transformations, Histogram processing, Smoothing and Sharpening spatial filters

MODULE-II

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Smoothing and Sharpening frequency domain filters, Homomorphic filtering, IMAGE RESTORATION: Noise models, Restoration in the presence of noise only-spatial filtering, Estimating the degradation functions, Inverse filtering, COLOR IMAGE PROCESSING: Color models, Pseudo-color processing, IMAGE COMPRESSION: Image compression models, Loss-less and Lossy compression.

MODULE-III

MORPHOLOGICAL IMAGE PROCESSING: Dilation and erosion, Opening and closing, Some basic morphological algorithms, IMAGE SEGMENTATION: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region based segmentation, RECENT DEVELOPMENTS**.**

TEXT BOOKS

2. R. C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson Education, 2006
3. R. C. Gonzalez , R.E. Woods and Eddins, Digital Image Processing using MATLAB, Pearson Education

REFERENCE BOOKS

A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education, 2007

1. B.Chanda & D. Dutta Majumdar , Digital Image Processing and Analysis, PHI, 2001.
2. Alasdair McAndrew , Introduction to Digital Image Processing with MATLAB, Cengage Learning, 2004

EC-423 DIGITAL SPEECH PROCESSING TECHNIQUES (3-0-0)

MODULE-I

Background: Pattern Classification, Statistical Pattern Classification. Introduction to Digital Speech Processing.

Digital Models : Process of Speech Production, Acoustic Theory of Speech Production, Digital Models for Speech Signals.

MODULE-II

Digital Representation : Speech Signals and Representations or Feature Extraction, Digital Representation of speech Waveform. Sampling speech signals, Statistical Model, Instantaneous

quantization, Instantaneous companding, Quantization for optimum SNR, Adaptive Quantization, Feed-Forward and Feedback adaptations, Speech production model, Linear Predictive Coding (LPC) Analysis, Block diagram of Simplified Model for Speech production. Basic Principles of Linear predictive Analysis- The Auto Correlation Method. Computation of the Gain for the Model, The Prediction Error Signal.

MODULE-III

Speech Recognition : Speech Recognition and Understanding, Automatic Speech Recognition(ASR): Feature extraction, Hidden Markov Model (HMM),

Digital Speech Processing for Man-machine Communication by voice, Speaker Recognition Systems – Speaker Verification and speaker Identification Systems.

TEXT BOOKS

1. L.R. Rabiner, R.W. Schafer, Digital Processing of Speech Signals, , Pearson Education.
2. B. Gold, N. Morgan, Speech and Audio Signal Processing, John Wiley & Sons.

REFERENCE BOOKS

1. Quatieri, Discrete-Time Speech Signal Processing, Pearson Education.
2. Kondoz, Digital Speech, John Wiley & Sons.
3. Rabiner & Juang, Fundamental of Speech Recognition, Pearson Education.

CS-301 OPERATING SYSTEMS (3-0-0)

MODULE-I (15 Hours)

Introduction: What is an Operating System, Evolution of operating system, Simple Batch Systems, Multiprogramming and Time Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. **Operating system structures**: O.S. Services, system calls, operating system structure. **Process Management:** Process concept, Process Scheduling, Operation on Processes, Cooperating Processes. Inter-process communication. Threads: User and Kernel level threads. **CPU Scheduling:** Basic concepts, scheduling criteria, scheduling algorithms. **Process synchronization:** Background , Critical section problem, Hardware Primitives Semaphore, Overview of classical synchronization problems, Monitors

MODULE-II (15 Hours)

Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, Recovery from Deadlock. **Memory management:** Background, address Binding, Logical versus Physical Address space, Overlays, contiguous Allocation. Paging, Segmentation. Segmentation with paging. **Virtual Memory:** Background, Demand paging, performance of Demand paging, Page Replacement Algorithms. Allocation of frames, Thrashing,

MODULE – III (10 Hours)

File-system: File concept, Access Methods, Directory structure & implementation, Allocation Method, Free space management. **I/O systems:** Overview, I/O Hardware, Application of I/O interface, Kernel I/O - subsystem Transforming I/O requests to Hardware Operations. Secondary storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap space Management, Disk Reliability. UNIX Operating System calls and interprocess communication, Case study.

TEXT BOOK

1. Abraham Silberschatz and Peter Bear Galvin, Operating System Concepts, Addison Wesley.

REFERENCE BOOKS

1. H.M Deitel, Operating System, Addison Wesley
2. Milenkovic, M , Operating Systems – concepts and Design, McGraw Hill International.
3. Andrew, S Tannenbaum, Operating System, PHI

CS-428 COMPUTER ARCHITECTURE AND ORGANIZATION (3-0-0)

MODULE –I

Basic structures of Computers: Functional units, operational concepts, Bus structures, Software, Performance, Multiprocessors and multicomputers. **Machine Instruction and Programms**: Memory location and addresses, Memory Operations, Instructions and instruction Sequencing, Addressing modes, Assembly Language, Basic Input/Output operations, subroutine, additional Instructions.

MODULE – II

Arithmetic : Addition and subtraction of signed Numbers, Design of Fast Adders, Multiplication of positive Numbers, Signed-operand multiplication , Fast multiplication, Integer Division, Floating-point Numbers, (IEEE754 s…) and operations.

MODULE – III

Basic Processing units: Fundamental concepts, execution of complete Instructions, Multibus organization, Hardwired control, Micro programmed control

Memory System: Basic Concepts, cache Memory, performance consideration, Virtual memories, Memory Management requirement, secondary storage.

TEXT BOOKS

1. Carl Hamacher, Zvonkovranesic, Safwat Zaky, Computer Organization, Mc Graw Hill.
2. Computer system Architecture: Morris M. Mano PHI NewDelhi

REFERENCE BOOKS

1. Computer Organization and Design Hardware/ Software Interface: David A. Patterson, John L. Hennessy ELSEVIER.
2. Computer Architecture and Organisations, Design principles and Application. B. Govinda Rajalu, Tata McGraw-Hill Publishing company Ltd
3. Computer Architecture and Organization. John P. Hayes Mc Graw Hill introduction.

CS-421 SOFTWARE ENGINEERING (3-0-0)

MODULE-I (15 Hours)

Introduction to Information System Development: Overview of System Analysis and Design, Categories of Information Systems, System development Strategies, Implementation and Evaluation, Tools for System development, **Introduction to software Engineering:** Basic concepts about software and program and Evolution of Software Engineering, Basic concepts on process and life cycle models. **Models:** Waterfall, Prototype, Evolutionary, Incremental, spiral, V, RADM etc. Requirement Analysis: Introduction to software specification, its needs and importance, formal specification methods. SRS: Attributes of good SRS and organization of SRS document.

MODULE-II (15 Hours)

Software design: Methods and strategies, desirable design attributes, Concept of good design, Cohesion and coupling. Function-Oriented Software Design: structured system analysis and structured design, formal approach design, data flow oriented design. Software coding and testing: coding standard and guidelines, code review, software inspection, **Testing:** Unit, Integration, System testing, black box and white box testing Incremental testing, formal proof of correctness, software matrix. Introduction to software verifications.

MODULE-III (10 Hours)

Software Reliability and Quality Management: S/W and H/W reliability, Reliability Matrices, S/W quality, ISO 9000 , Software engineering management: introduction to capability maturity model, quality assurance and software cost estimation (Delphi, COCOMO). Introduction to Computer-aided Software Engineering, Software reuse and maintenance.

TEXT BOOKS

1. Rajib Mall : Fundamentals of Software Engineering , PHI.
2. R.S. Pressman: Software Engineering, A practitioner's approach, McGraw Hill.

REFERENCE BOOKS

1. P. Jalote: An integrated approach to software engineering. Narosa, New Delhi.
2. G. Booch : Object-Oriented analysis and design, Benjamin / Cumming Publishing Co. New York.
3. James A. Senn: Analysis and Design of Information Systems, McGraw Hill
4. Hong Zhu : Software Design Methodology, Elsevier

EC – 445 COMPUTER COMMUNICATION NETWORKS (3-0-0)

MODULE-I (11 Hours)

Approach to Network Design. Key factors in Communication Network Evolution. Applications and layered Architecture. The OSI Reference Model. Overview of TCP/IP Architecture.

Complete Block diagram of a Digital Communication System including coding, decoding, Equalizer, diversity facilities – one for wired – and other for wireless connection emphasing the basic principle of operation. Concept of Bandwidth, data rate, capacity, error ditection and correction capabilities of the system. A brief introduction to co-ax cable and optical fiber and especially the latters serving as backbone of modern Internet System. Wireless Channels and their associated problems.

Introducing the concepts of Frequency Division Multiplexing, Time Division Multiplexing and Wavelength Division Multiplexing.

MODULE-II (15 Hours)

SONET Multiplexing and Sonet frame structure. Circuit Switching and Packet Switching, Signaling system Architecture. Cellular Telephone Network. Satellite Cellular Network.

Peer-to-Pear protocols & service models. ARQ protocol. Other Adaptation Functions. Data line Controls. Local Area Network and Medium Access Control Protocols: LAN structure; the medium Access Control sub layer, the logical link control layer. Random Access – Aloha, slotted Aloha, CSMA, CSMA-CD. Scheduling approaches to Medium Access Control. LAN Standards.

MODULE-III (15 Hours)

Packet Switching Networks: Routing in Packet Networks. Shortest Path Algorithms. ATM Networks. Traffic Management and QOS. Congestion Control. TCP/IP: The TCP/IP Architecture. The Internet Protocols, IPV6. User Datagram Protocol. Transmission Control Protocol. Dynamic Host Configuration Protocol, Mobile IP. Internet Routing Protocol. Multicast Routing.

TEXT BOOKS

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks, Tata McGraw Hill Publishing Co., New Delhi, Selection Portion from Ch. 1,2,3,4,5,6,7 and 8.

REFERENCE BOOKS

2. William Stallings, Data & Computer Communication, Pearson Education

EC-451 NEURAL NETWORKS AND APPLICATIONS (3-0-0)

MODULE-I

Fundamental Concepts: Introduction to Artificial Neural Networks (ANN), models of neuron

Learning Methods: Error–correction learning, Hebbian learning, competitive learning, supervised learning, and other learning techniques.

Single neuron/ Perceptron networks: training methodology, typical application to linearly separable problems.

Multilayer Perceptron: Back propagation algorithm, virtues and limitation of BP algorithm, modifications to back-propagation.

MODULE-II

Radial-basis function Networks: interpolation problem, Covers theorem, Applications.

Recurrent Networks: Hopfield Networks.

MODULE-III

Application of ANN: Matrix Algebra Problems, Adaptive Filtering and Adaptive Pattern Recognition Problems.

TEXT BOOKS

1. B. Yegnanarayama, Artificial Neural Networks, PHI
2. Martin T. Hagan, Howard B. Demuth, Mark H. Beale; *Neural Network Design*; (ISBN: 0-9717321-0-8); Thomson 2002
3. F M Ham, I Kostanic, Principles of Neuro computing for science and engineering, TMH Publishing company.

REFERENCE BOOKS

1. Satish Kumar; Neural Networks: A Classroom approach, Tata McGraw Hill, 2004, ISBN: 9780070482920.
2. S. Haykin, Neural Networks - A Comprehensive Foundation; Pearson Education, India

IC-324 ADVANCED CONTROL SYSTEM ENGG. (3-1-0)

MODULE-I (12 Hours)

Mathematical modeling of dynamic systems in state space, state space representation of Mechanical and Electric systems, State equations and transfer functions, Characteristics equation, Eigenvalues and Eigenvector of state Matrix Solution of time-invariant state equation, determination of State Transition Matrix, use of Carley –Hamilton Theorem Controllability, Observability,.

MODULE-II (12 Hours)

Introduction to design of control systems in state space, design of phase lead qnd phase lag controllers in time and frequency domain, pole placement design. State observers.

Sampling and Signal reconstruction: definition of Z-Transform, properties of Z-Transform, Inverse Transform, Mapping between S-plane and Z-plane, system descriptions by difference equations and solutions.

Sample data control systems: Transfer function of discrete data systems, Pulse and Z-Transform functions, transfer functions of discrete data system with cascade element, transfer function of Zero order and 1st order holds, transfer function of closed loop discrete data systems.

MODULE –III (12 Hours)

Non linear systems: Common physical nonlinearities, the phase plane methods, Basic concepts, Singular points, stability of nonlinear systems, Construction of phase trajectories, Construction by analytical and graphical methods. System analysis by phase plane method

The describing function methods: Basic concepts, derivation of describing functions for common non linearities, stability analysis by Describing function approach, Jump resonance, Lyapunov stability criterion, Popov's stability criterion.

TEXT BOOKS

1. K. Ogata, Modern Control Engineering, PHI
2. B.C. Kuo, Automatic Control System, PHI
3. Gopal M., Digital Control and State Variable Methods, "Tata McGraw Hill, New Delhi, 1997.

EC- 452 SOFT COMPUTING (3-0-0)

MODULE-I

Neural networks, Introduction, Neuron Models, Supervised and Unsupervised Learning Methods, Single Neuron/ Perceptron Networks, Training Methods, Applications to Linearly separable problems, Multi layered perceptrons, Back-propagation algorithm, Introduction to Fuzzy systems, Membership function, Fuzzy relational operation, fuzzy IF THEN rules, Defuzzyffication – Sugeno and Mamdani type systems, Adaptive Neuro-Fuzzy Sytems, Training Methods.

MODULE-II

Genetic Algorithm: Basic Concepts, Search Space, Working Principle. Encoding: Binary, Octal, Hexadecimal, Permutation, Value and Tree. Decoding, Fitness Function, Selection: Roulette-wheel, Tournament, Rank and Steady-state. Elitism, Crossover: Single-Point, Two-Point, Multi-Point, Uniform, Matrix And Cross Over Rate, Mutation: Mutation, Mutation Rate.

Ant Colony Optimization: Ant Foraging Behavior, Combinatorial Optimization, Routing In Communication Network,

MODULE-III

Application: Control; Communication Engineering; System Identification And Pattern Classification, Function Optimization, Adaptive System Identification, Channel Equalization.

TEXT BOOKS

1. S. Haykin, Neural Networks, A Comprehensive Foundation, Pearson Education, India
2. Martin T. Hagan, Howard B. Demuth, Mark H. Beale; Neural Network Design; Thomson 2002
3. Jang, Sun and Mizutani; Neuro-Fuzzy and Soft-Computing – A computational approach to learning and machine intelligence, Prentice Hall of India David E. Goldberg, Genetic Algorithms in search, Optimization and machine learning, 1989.

REFERENCE BOOKS

1. Satish Kumar, A Classroom approach, Neural Networks: Tata McGraw Hill, 2004,

IT-411 INTERNET AND WEB TECHNOLOGY (3-0-0)

MODULE-I (17 Hours)

Internet Basics: Basic Concepts, Communication on the Internet, Internet Domains, TCP/IP and Internet, Application Protocols, Idea of Web Server, Web Browser. **Web Design:** HTML Tags, Color and Background, text formatting tags, creating hyperlinks and anchors, Image, Image map, table, frame, Designing Forms and controls, Multimedia in Web DHTML, Style sheet. **Client Side Scripting:** Introduction to Client side Scripting, Programming Fundamentals, Java Script Document Object Model, built in object, form object and element, working with data, flow control structures, operator, custom function and object, data entry and validation using tables and forms using JavaScript, VBScript functionalities, VBScript controls. **Server Side Scripting:** Introduction to Server side Scripting, ASP Objects and Components, Working of .asp files, CGI Basics, Why CGI is used? How it Works? Get and Post methods.

MODULE-II (15 Hours)

Introduction to Java Enterprise Edition 5: Programming for the Enterprise, Enterprise Architecture (Single tier, two tier, three tier, N tier, Enterprise) and Technologies, Introduction to Web Application. **Java Servlets:** Introduction to Web Containers, Servlet Programming, Servlet vs. Applet, Servlet API, GenericServlet Class, HttpServlet Class, Servlet Architecture, Servlet life Cycle, Working with Servlet, Working with Databases, Servlet Sessions, Cookies, Context and Collaboration. **Java Server Pages:** Basics and Architecture, Life Cycle of JSP Page, JSP Directives, Scripting Elements, Standard Action Elements of JSP, Implicit Objects and scope, Writing JSP application with standard Tag Libraries, Connecting to Databases. **XML:** Introduction, XML Document Syntax, Document Type Definition, Parsing valid XML, SAX, DOM.

MODULE-III (8 Hours)

Distributed Computing Using RMI: Basics, RMI Architecture, Locating Remote Objects, RMI Exceptions, and Developing Applications with RMI, Understanding Directory Services and JNDI. **Enterprise Java Beans:** Introduction, EJB vs. Java Beans, EJB Architecture, Features/ Benefits of EJB, Types of EJB, Working with Session Beans, Entity Beans.

TEXT BOOKS

1. Ivan Bayross, Web Technologies, Vol-I and Vol-II , BPB Publications.
2. Subrajmanyam Allamaraju and others, Professional Java Server Programming J2EE 1.3 Edn., Apress, SPD.

REFERENCE BOOKS

1. Ivan Bayross and Others, Java Server Programming for Professional covers JAVA EE 5, SPD.
2. Bruce W. Perry, Danny Ayers and others, Professional Java Server Programming, Wrox Press ltd, SPD.
3. Dream Tech Press , Java Server Programming (J2EE 1.4) Black Book" "Java Servlet & JSP", Cookbook SPD-O'Reilly
4. SL-134 Web Component with Servlets & JSP Technologies, Sun Solaris.
5. FJ-310-EE5 Developing Applications for the Java EE Platform, Sun Solaris.
6. SL-285-SE6 Developing Applications with the Java SE Platform, Sun Solaris.

CS-416 BIOINFORMATICS (3-0-0)

MODULE-I (12 Hours)

Basic Concepts of Molecular Biology: Cellular Architecture, Nucleic Acids (RNA & DNA) Transcription and Translations, Open reading frame, Genetic code, Protein structure and function, Molecular biology tools. Suffix Trees: Definition and examples Ukkonen's linear-time suffix tree algorithm, Applications longest common sub strings of two strings, Recognizing DNA contamination. Pair wise Sequence Alignment (Edit distance, Dynamic Programming Calculation of edit distance, string similarity, gaps).

MODULE-III (14 Hours)

Pair wise sequence alignment local, Multiple String Alignment, Need of MSA, Family & Super Family representation, multiple sequence comparison for structural inferences, Multiple alignments with sum-of- pairs, consensus objective functions. Database searching for similar sequence (FASTA, BLAST), PAM, BLOSOM SUBSTITUTION MATRICES.

MODULE-III (14 Hours)

Sequencing (DNA sequencing, shortest superstring problem, DNA Arrays, sequencing by Hybridization) Phylogenetic analysis (Evolutionary Trees, Distance and character based true reconstruction, Reconstructing trees from additive matrices, Evlutionary trees and hierarchical clustering –VPGMA Neighbors Joining,) small and large parsivrony problem.

TEXT BOOKS

1. Dan Gusfield, Algorithm on strings, Trees and Sequences: Computer Science & Computational Biology, Cambridge University Press, 1997 (Chapters: 5, 6, 7, 10, 11, 14 & 15 relevant portions)
2. N. C. Jones and P. A PEVZNER- An Introduction to Bioinformatics Algorithms- MIT press, 2009 (chapters 3, 8 7 10 – relevant portions)
3. D. E. Krane & M. L. Raymer- Fundamental concepts of Bioinformatics – Pearson Education, 2003 (Chapter-1)

REFERENCE BOOK

1. D. Baxevanis, B. F. Francis one llitte Bioinformatics, Wiley- Interscience

EC-463 MICROWAVE COMMUNICATION SYSTEMS (3-0-0)

MODULE-I (12 Hours)

Block diagram of Transmitter and Receiver of an Analogue and a Digital Microwave Communication Systems. Processing of Analogue Baseband Signal. Processing of Digital Baseband Signal. Generation of Subcarriers and Pilot carriers. Frequency Modulation of base band signal. Digital baseband format carrier modulation of digital baseband signal. The standard groups; Super group, Master group and Super Master group. FM Bandwidth.

MODULE-II (10 Hours)

The Receivers:- FM demodulation, Setting of threshold. FM Demultiplexing. Gain, Bandwidth, efficiencies of Parabolic Reflector antenna at Microwave frequency. Repeater stations. Line of sight path characteristics. Performance parameters of solid state Microwave Amplifier. Practical Design Specification. Design of LOS Analogue.

MODULE-III (12 Hours)

Microwave link. Design of LOS, Digital link. Diversity: Frequency, Polarization and space diversity, Hybrid Diversity. Antenna Tower heights. Path clearance. Protection Switching Arrangements. Microwave Radio System Gain.

Note: The instructor should workout as many problems as possible in the class and through home assignment.

TEXT BOOKS

1. Wayne Tomasi, Electronic Communication Systems, 5th Edition, Pearson Education Chapter 24.
2. Harold Kolimbins, Digital Communication Systems, Chapter 4.

REFERENCE BOOK

1. P.V. Sreekanth, Digital Microwave Communication Systems, University Press.

EI-425 EMBEDDED SYSTEM DESIGN (3-0-0)

MODULE-I (14 Hours)

Introduction:

An Embedded System, Processor in the System, Other hardware units, Software embedded into a system, Exemplary Embedded System-on-Chip (SOC) and VLSI circuit.

Devices and Device Drivers: I/O Devices, Timer and counting Devices, Serial communication using IC, CAN and advanced I/O buses between the networked multiple devices, Host system or computer parallel communication between networked I/O multiple devices using ISA,PCI, PCI-X and advanced buses, Device Drivers, Parallel Port Device Drivers in a System. Serial Port Device in a system, Interrupt servicing (Handling) mechanism.

MODULE-II (14 hours)

Software and Programming Concepts: Processor selection for an embedded system, memory selection for an embedded system, Embedded programming in C++, Embedded Programming in JAVA, Unified modeling language (UML), Multiple Processes and Application, Problem of sharing data by multiple tasks and routines, Inter Process Communication.

Real Time Operating System: Operating system services, I/O subsystem, Network Operating System, Real time and Embedded System, Need of well tested and debugged Real time Operating System (RTOS), Introduction to C/OS-II.

MODULE-III (12 hours)

Case Studies of Programming with RTOS: Automatic vending machine, Adaptive Cruise Control System for a Car, Smart Card.

Hardware and Software Co-design: Embedded system project management, embedded system design and co-design issues in system development process, Design cycle in development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

TEXT BOOKS:

1. Embedded systems-Architecture, Programming and Design.
   By: Raj Kamal, Tata McGraw Hill, ISBN: 0070494703
2. Languages for Digital Embedded Systems. By: Stephen A. Edwards, Kluwer, 2000, ISBN:

REFERENCE BOOKS:

1. Stuart R. Ball, Embedded Microprocessor Systems: Real World Design, Butterworth-Heinemann Publishers, 3rd edition, 2002, ISBN: 0750675349
2. Jack G. Ganssle, The Art of Programming Embedded systems. academic Press,1992, ISBN:0122748808.

IT-401 ESSENTIALS OF IT (3-0-0)

MODULE-I (10 Hours)

Fundamentals of Computer Architecture-Introduction-Organization of computer, Central Processing Unit-Execution Cycle- Instruction categories- measure of CPU performance, Memory-Input/Output devices-BUS- addressing modes, System software-Assemblers-Loaders and Linkers-Compilers and Interpreters, Operating system-Introduction- Process management scheduling-Memory management-Threads. Problem Solving with Algorithms, analysis of algorithms-Asymptotic notations

MODULE-II (12 Hours)

RDBMS-data processing-the database technology-data models, ER-modelling concepts-notations-Extended ER features, Logical database design-Normalization, SQL-DDL statements-DML statements-DCL statements, SQL tuning techniques. Objects oriented concepts-object oriented programming, UML class Diagrams-relationships-Inheritance-Abstract classes-Polymorphism, and Object Oriented Design methodology.

MODULE-III (08 Hours)

System Development Methodologies-Software Development Models, Components of Web Application-Browsers and Web servers, World Wide Web, URL-HTML-HTTP protocol-Web Applications-Application Servers-Web Security.

1. Table Creation and Queries using SQL
2. A Simple project on Database Design
3. Design the Bio- Data From using HTML

All the assignments will be done in the Computer lab.

TEXT BOOKS

1. Abraham Silberschatz and Peter Bear Galvin, Operating system concepts, Addison welsley.
2. David A. Patterson, John L. Hennessy, Computer Organisation & Design , Elsevier.
3. R. Elmasri, S. Navatne : 4th Edition, Fundamental of Database Systems, Pearson Education.
4. Blaha, Rumbaugh, Object-oriented Modelling & Design with UML,: PHI

REFERENCE

1. Infosys course materials.

CS-306 MANAGEMENT INFORMATION SYSTEM (3-0-0)

MODULE-I (12 Hours)

Fundamentals of Information Systems, Systems approach to problem solving, Developing information system solutions. Information system components, Information quality, Data resource management, Database, Data models, Information Systems in marketing, manufacturing, HRM, Accounting and Finance.

MODULE-II (12 Hours)

Information analysis and design tools : Decision tools, Decision Table, Structured Analysis, Dataflow Analysis, Tools for dataflow strategy, Developing dataflow diagrams, Leveling, Data dictionary, Structured flow chart, HIPO, Warnier/ORR diagram.

MODULE-III (12 Hours)

Planning & implementation of Information Systems, Transaction Processing Systems, Executive information Systems, Decision Support Systems, Expert Systems, Knowledge Management. Computer crime, Security (Goals, risks, controls, security & recovery measures of IS, economics of information security) & ethical challenges.

TEXT BOOKS

1. James A. O'Brien, George M. Marakas, Management Information Systems, Eighth Edition, 2008, McGraw-Hill Education (India), New Delhi.
2. Kenneth C. Laudon, Jane P. Laudon, Management Information Systems, Tenth Edition, Pearson Education Inc., New Delhi.

REFERENCE BOOKS

1. Kenneth E. Kendall, Julie E. Kendall , System Analysis and design, PHI Learning Pvt. Ltd., New Delhi.
2. James A. Senn ,Analysis & Design of Information Systems, McGraw-Hill Education, New Delhi
3. Effy Oz, Management Information Systems, Sixth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
4. Robert G. Murdick, Joel E. Ross, James R. Claggett, Information Systems for Modern Management, Third Edition, PHI Learning Pvt. Ltd., New Delhi.
5. Stephen Haag, Maeve Cummings, Amy Philips, Management Information Systems, Sixth Edition, 2007, McGraw-Hill Education (India), New Delhi.
6. Gordon B. Davis, Margarethe H. Olson, Management Information Systems, Second Edition, 1985, McGraw-Hill Education (India), New Delhi.
7. Mahadeo Jaiswal, Monika Mital, Management Information Systems, First Edition, 2004, Oxford University Press, New Delhi.

HS-402 PRINCIPLES OF MANAGEMENT (3-0-0)

MODULE-I [12 hours]

Introduction to Management: Science, Theory and Practice; Importance and Scope of Management; Evolution of Management Thought; Management and Environment- Environmental Impact on the Management Process; Globalisation and Business Environment; Social Responsibilities and Obligations of Business Management.

Importance of Management in Engineering and Technology - Critical Factors in Managing Technology, Management of Technology and Global Competitiveness, Formulation of a Technology Strategy; Creating the Product-Technology-Business Connection, Technology Planning, Technology as an Instrument of Competition.

MODULE-II [12 hours]

The Process of Management; Planning – Essentials of Planning and Managing by Objectives, Strategies, Policies, Planning Perishes, and Decision Making; Organising – Principles of Organization, Organization Structure, Effective Organizing and Organization Culture; Directing – Crisis Management and Corporate Governance; Staffing – Selection, Training, Development, Appraisal,

Knowledge Management; Controlling – The System and Process of Controlling, Control Techniques and Information Technology.

MODULE-III [12 hours]

Functions of Management – Marketing Function of Management, Morden Concept of Marketing, Functional Classification of Marketing, Marketing Mix, Fundamental Needs of Customers, Role of Distribution Channels and Advertising; Financial Functions of Management – Concept of Financial Management, Project Appraisal, Tools of Financial Decision Making, Introduction to Short-Term and Long-Term Sources of Financing.

TEXT BOOKS

1. Essentials of Management, Harold Koontz and Heinz Weihrich, Tata McGraw Hill, 8th Edition, 2010.
2. Business Organisation and Managemnt, C. R. Basu, Tata McGraw Hill, 3rd Reprint, 2008.
3. Management of Technology, Tarek Khalil, Tata McGraw-Hill Edition, 2009.

REFERENCE BOOKS

1. Management – Theory and Practice, C. B. Gupta, 14th Edition, S. Chand & Sons, 2009.
2. Financial Management, I. M. Pandey, Vikas Publications, 9th Edition, 2009.

EC – 442 MOBILE COMMUNICATION ENGINEERING (3-1-0)

MODULE-I (15 Hours)

Cellular Concept & System Design: Fundamentals Hexagonal Cell, Frequency reuse, Handoff, Interferences and System Capacity, Adjacent Channel interference. Improving coverage and capacity in Cellular Systems – Cell Splitting, Sectoring, Microcell Zone Concept. **Mobile Radio Propagation** : Large –Scale path loss Free space propagation model, Reflection, Ground Reflection (2-ray) Model, Diffraction, Scattering. Practical link budget design using path loss model. Determination of percentage of coverage area. Outdoor propagation Model – Okumura Model; Small scale fading & multipath - Factors influence small scale fading. Parameters of Mobile Multipath Channels, Time dispersion parameters, Coherence Bandwidth and Coherence time of a Channel, Flat Channel, Frequency Selective Channel. **Modulation Techniques for mobile radio** : $\pi/4$ QPSK, Minimum shift keying MSK Gaussian minimum shift keying GMSK, OFDM and their performance analysis.

MODULE-II (15 Hours)

Spread Spectrum Techniques : PN Sequence, DS-SS, PH-Ss and their performances, in fading and Multipath channels. **Equalization and Diversity**: Fundamental of equalization, Linear Equalizers, Maximum Likelihood Sequence Estimation Equalizer (MLSE). Least Mean Square algorithm. Diversity Techniques : Space diversity, frequency diversity, Polarization diversity & Time diversity. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Sense CDMA.

MODULE-III (10 Hours)

Wireless Network, Circuit switching & Packet Switching, Traffic Routing; The OSI Model GSM; System Architecture, Protocols; Localization and calling. Handover, Security. Introduction to SS7 signaling, Wireless Application Protocol (WAP), Mobile IP, and Mobile TCP.

TEXT BOOKS :

1. Theodore S. Rappaport , Wireless Communication, 2nd Edition, Pearson Publication. Selected portions from Chapter 3, 4, 5, 6, 7, 9, 10 and 11.
2. Jocken Schiller, Mobile Communication, 2nd Edition, Pearson Education.

REFERENCE BOOKS:

1. Simon Haykin and Michael Moher, Modern Wireless Communication , Pearson Education.

ELECTIVE – IV (Any Two)

EC - 444 ADVANCED COMMUNICATION SYSTEMS

EC - 422 ADVANCED DIGITAL SIGNAL PROCESSING

EC - 412 MICROWAVE & RF INTEGRATED CIRCUITS

EC - 462 RADAR SYSTEM ENGINEERING

EC - 446 ADVANCED OPTICAL COMMUNICATION SYSTEMS

IT - 314 PROGRAMMING WITH JAVA

EC - 424 ADAPTIVE SIGNAL PROCESSING

CS - 419 DATA MINING

EC - 464 PHASED ARRAY RADAR SYSTEM

EC - 444 ADVANCED COMMUNICATION SYSTEM (3-0-0)

MODULE-I (10 Hours)

Review of fundamental concept of Digital Communication:

Binary modulated Bandpass signaling:- OOK, BPSK, DPSK, FSK, Multilevel modulated Bandpass signaling- QPSK, MPSK, QAM, OQPSK, $\pi/4$ QPSK-their PSD; minimum shift keying & GMSK OFDM, Trellis Code Modulation.

Multiplexing:- T1 digital carrier system, Frame synchronization, Bit interleaving Vrs. Word interleaving, composite baseband signal, WDM.

MODULE-II (15 Hours)

Microwave radio communication system:- FM microwave radio-system- Transmitter, Receiver, Repeaters, Diversity, Protection switching arrangement, FM microwave radio station, Microwave Repeater Station path characteristics, system Gain.

Satellite communication system:- Satellite orbit, Geostationary satellite, Antenna look angle. Digital & Analog TV transmission, Data and signal multiple access, Link budget analysis- signal power received, characterization of noise sources, link budget evaluation, E_b/N_0 link budget digital system, path loss.

MODULE-III (08 Hours)

Wireless Communication:- Cellular telephone system-1G, 2G & 3G system, frequency reuse, cell splitting, propagation effect, FDMA, TDMA & CDMA wireless communication system, GSM, IS-95 and GPS.

TEXT BOOKS

1. W. Tomasi, Electronics communication system (5^{th} edition), Pearson Education, Chapter 9,11,20,24, and 25.
2. Leon W Couch II, Fundamentals through Advanced Digital & Analog Communication System (6^{th} Edition), Pearson Education.

REFERENCE BOOKS

1. Simon Haykins, Communication System (4^{th} edition), John Willey & Sons Inc.

EC-422 ADVANCED DIGITAL SIGNAL PROCESSING (3-0-0)

MODULE-II

Quantization and round off effects in digital filters : Fixed and floating point representation of numbers, errors resulting from rounding and truncation.

Multi-rate digital signal processing: decimation by a factor D, interpolation by a factor I, sampling rate conversion by a national factor I/D. ; sampling rate conversion of band pass signals. ; Implementation of low pass filter and digital filter banks. ; Lattice filters,

MODULE-II

Linear prediction, forward and backward linear prediction, FIR wiener filter. ;

Power spectrum estimation, non-parametric method barlett, parametric method. ; yule-walker, AR, MA and ARMA models.

MODULE-III

DSP Transforms: Discrete sine transform, Discrete Cosine Transform, Discrete Hartely Transform and applications.

TEXT BOOKS

1. J.G. Proakis, D.G. Manolakis, , "Digital Signal Processing", PHI, New Delhi, 1995.
2. Sanjit K. Mitra. , " Digital Signal Processing: A Computer Based Approach. McGraw Hill, 1998.
3. P.P. Vaidyanathan, "Multirate Systems And Filter Banks." Prentice Hall. PTR. 1993.
4. Monson H Hayes, Statistical Digital Signal Processing And Modeling , Wiley Publication.

EC-412 MICROWAVES AND RF INTEGRATED CIRCUITS (3-0-0)

MODULE-I (12 Hours)

Elements of Microwave Integrated Circuits (MIC)

Planar transmission line, Lumped element for MIC substrate for MIC, Hybrid Technology – Thin film, thick film and mid film technologies. Monolithic technology.

Planar Transmission Lines – Method of Analysis

TEM Analysis ; Method of conformal transformation, Variational approach ; Transverse Transmission line Technique. Finite Difference Method.

MODULE-II (10 Hours)

Analysis of stripline : Symmetric stripline with zero thickness centre Conductor – Conformal Transformation Method ;

Analysis of coupled striplines : Edge coupled Symmetric stripline – Conformal Transformation Method.

MODULE-III (13 Hours)

Circuit Design and Applications, Basic circuit elements ; Transmission line sections and stubs ; coupled line filter elements, Impedance matching network, Lumped Elements. Branchline directional couplers. Hybrid Rings and Baluns. Power dividers.

TEXT BOOKS

1. Bharathi Bhat and Shibon K. Koul, Microwave Integrated Circuits, Willy Eastern Limited.
2. Mathew M. Radmanesh, Radio frequency and Microwave Electronics illustrated, Pearson Publicatin, Chapter 21.

EC-462 RADAR SYSTEM ENGINEERING (3-0-0)

MODULE-I (10 Hours)

Radar Equation. Minimum detectable signal, Probability density functions. SNR, Integration of Radar Pulses, RCS of targets, PRF and Range ambiguity, Antenna Parameters, System losses, Propagation effects. CW and Frequency Modulated Radar, Doppler Effect, CW Radar, FMCW Radar, Multiple Frequency CW Radar.

MODULE-II (12 Hours)

MTI and Pulse Doppler Radar: MTI Radar, Delay line canceller, Subclutter visibility. MTI using Range gater & filters. Pulse Doppler Radar. Tracking Radar: Sequential lobing, Conical scan and Monopulse types. Comparison of trackers.

MODULE-III (10 Hours)

Modern Radar Systems: Pulse compression Radar; Radar Beacons, Synthetic Aperture Radar; Phased Array Radars – Phase and Frequency Scanning.

TEXT BOOKS

1. Merrill I. Skolnik, Introduction to Radar Systems, Tata-McGraw Hill.

REFERENCE BOOKS

2. Merrill I. Skolnik, Radar Handbook – 2nd Edition– McGraw Hill International Edition.

EC-446 ADVANCED OPTICAL COMMUNICATION SYSTEMS (3-0-0)

MODULE-I (08 Hours)

Electromagnetics of optical Fiber: Mode theory for circular waveguides: waveguide equations, Modal Equation, Modes in step-index fibers, Linearly Polarized mode, Power flow in step-index fibers. Single mode fiber, Graded indeed fiber structure.

Single mode fibers: Coping with dispersion, dispersion compensating fibers; Non-linear effects in single mode fiber, Trends in fiber design.

MODULE-II (10 Hours)

WDM concepts and components: Passive components – couplers, Machzehnder Interferometer Multiplexer, Bragg Grating filter, Phase-Array based WDM devices, optical filters.

Optical Amplifiers: Semiconductor Optical Amplifier, EDFA; Wavelength Converters.

MODULE-III (10 Hours)

Optical Networks: SONET / SDH, Broadcast-and-select WDM Network, Wavelength-Routed Network; Non-linear effects on NW performance; Performance of WDM+EDFA system & optical CDMA; Ultra high capacity networks.

TEXT BOOKS

1. Gerd Keiser, Optical Fiber Communications – 3rd Edition, McGraw Hill.
2. Djafar K. Mynbaer and Lowell L. Scheiner, Fiber Optic Communication and Technology, Pearson Education.

IT-314 PROGRAMMING WITH JAVA (3-0-0)

MODULE –I (12 Hours)

Introduction to Java and Java programming Environment: History and Features of Java, Java Development Kit, JRE.

Fundamental programming structures in Java: Data Types, Variables, Assignments and initializations, Type Conversion and Casting, Arrays, Operators and their precedence, Control Flow, Strings, Comments.

Concepts of Objects and Classes: Introduction to Object oriented programming, Using Existing classes, Building your own classes, constructor overloading, Garbage Collection, Overloading Method, static Fields and Method, Understanding final and this keyword.

Inheritance Basics: Extending Classes, Using super to call super class Constructors, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, Final Class and Method, Inner classes, The Object Class, The Class Class, Reflection.

Packages and Interfaces: Packages, Access Protection, importing packages, Interfaces, variables in interfaces, Interfaces can be extended, Interfaces vs. Abstract Class.

Exception Handling: Fundamentals, Dealing with Errors, Exception Types, Using try & catch, Multiple catch, thro, throws, finally, Java's Built-in exceptions, user defined exceptions, Assertions, Debugging Techniques.

MODULE –II (18 Hours)

Multi-Threading: Java Thread Model, Creating a thread, Creating multiple threads, Thread priorities, Thread Synchronization, Using isAlive() and join(), using wait() and notify().

String Handling: String constructors, String length; Character Extraction, String Comparison, Modifying a String.

Exploring java.Lang: Simple type wrappers, Runtime memory management, Object Cloning.

Java.util: The Collection interface, Collection classes, Use of Iterator, The Collection Algorithm, The legacy Classes and interface, String Tokenizer, Random

Java.io: The java I/O Classes and Interfaces, Stream classes Byte Stream, Character Stream, serialization, File Management in Java.

Applet: Basics, Architecture, Skeleton, The HTML Applet tag, Passing parameter to Applets, AppletContext and showDocument().

AWT: AWT Classes, Window fundamentals, Components, Container, Panel, Window, Frame, Canvas, Creating a Frame window in an Applet, Working with Graphics, AWT

Control Fundamentals, Layout management, Dialog Boxes.

MODULE –III (10 Hours)

Event Handling: Basics of Event Handling, Delegation Event model, Event Class, Event Listener interfaces, Adapter Classes, Handling Events by extending AWT components.

Swing: An Introduction, Features, JApplet, Icons and Labels, Text Fields, Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, Tables.

JDBC: Fundamentals, Type-I, Type-II, Type-III, Type-IV Drivers, Database connectivity programs.

Networking: Basics, Socket overview, Networking classes and interfaces, TCP/IP client sockets, URL connection, TCP/IP Server Sockets.

TEXT BOOKS

1. Herbert Schildt, "The Complete Reference Java 2, TMH
2. Balguruswamy, "Programming with Java", TMH.

REFERENCE BOOKS

1. Shirish Chavan, Java for Biginners, SPD.
2. Kathy Sierra and Bert Bates, Head First Java, O' Reilly, SPD.
3. Cay S. Horstmann & Gary Cornell, Core Java Vol-I & Vol-II, Sun MicroSystem Press.
4. SL-275-SE6 Java Programming Language, Sun Solaris.

EC-424 ADAPTIVE SIGNAL PROCESSING (3-0-0)

MODULE-I

Adaptive systems: Examples and applications.

Adaptive linear combiner : the performance function, gradient and minimum mean square error, alternative expression of gradient, LMS, NLMS, transform domain LMS, Recursive least square algorithm, windowed RLS , Block adaptive filter(time and DFT domains.

MODULE-II

IIR adaptive filter: equation error form. Adaptive filtering, adaptive channel equalization, Adaptive line enhancement and adaptive system identification. Applications of adaptive filter : 50hz Interference In Electrocardiography, Cancellation Of Donor-Heart Interference, Cancellation Of Maternal ECG In Electrocardiography, Cancellation Noise In Speech Signals, Adaptive Echo Cancellation.

MODULE-III

Adaptive control systems: Model Inverse and Model Reference Controls. Introduction of Adaptive Array and Adaptive Beam Forming.

TEXT BOOKS

1. Simon Haykin and Thomas Kailath, Adaptive Filter Theory, Pearson Education, 4th Edition, 2005.
2. Bernard Widrow and Samuel D. Sterns, Adaptive Signal Processing, Pearson Education, 2nd Indian reprint, 2002.

CS-419 DATA MINING (3-0-0)

MODULE-I (15 Hours)

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, OLAP Technology for Data Mining, Multidimensional Data Model. **Data Preprocessing:** Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

MODULE-II (10 Hours)

Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

MODULE-III (15 Hours)

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy. **Cluster Analysis Introduction:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods.

TEXT BOOK

1. Jiawei Han & Micheline Kamber Harcourt India., Data Mining – Concepts and Techniques.

REFERENCE BOOK

2. Arun K. Pujari, Data Mining Techniques, University Press
3. David J. Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining, MIT Press, Fall 2000.
4. Mehmed Kantardzic, Wiley, Data Mining: Concepts, Models, Methods, and Algorithm, IEEE Press, 2002.
5. Daniel T. Larose, John Wiley, Discovering Knowledge in Data : An Introduction to Data Mining, John Wiley & Sons, Hoboken, New Jersey, 2004.

EC-464 PHASED ARRAY ANTENNA SYSTEMS (3-0-0)

MODULE-I (15 Hours)

Phased Array Radars. Scanning of arrays.

Array Theory: Linear array. Beam steering by phase, frequency and switching, Plantar array: Grid structure, Element phasing calculation. Aperture matching and mutual coupling: Significance of aperture matching, Effects of mutual coupling, Element Pattern, Impedance variation of free space. Element Impedance. Mutual Coupling and surface waves. Array simulators. Compensation of scanned impedance variation.

MODULE-II (12 Hours)

Low side lobe phased arrays. Illumination functions. Effect of errors. Random errors. Quantization effect. Phase quantization, Periodic effects. Bandwidth of Phased Array – aperture effects, feed effects, variation of main beam width and side lobe level with scan. Types of scanning.

MODULE-III (08 Hours)

Feed Networks or Beam formers. Phase shifters: PIN diode phasers, ferrite phasers. Solid state MODULEs. Thinned Array. Phased Array systems.

TEXT BOOK

1. Merrill Skolnik Radar Handbook 2nd Edition, McGraw Hill , Chapter 7

REFERENCE BOOK

1. R.C. Hansen, Microwave scanning Antennas Vol. I, II, & III , Academic Press, New York 1964.

SESSIONALS

7th Semester

EI–471 VLSI LAB (0-0-3)

Lab '1' through '4' can be done using Tanner Spice/Magic tools

Lab '5' through '10' should be done using Xilinx or IRSIM or any other open source tools (GPSL)

List of experiments:

1. Characteristics of NMOS
2. Characteristics of CMOS
3. Stick Diagram: Introduction to λ rules
4. Implementation of inverter, NAND and NOR gates
5. Design of Half Adder
6. Design of Full Adder
7. Design of Multiplexer
8. Design of Decoder circuits
9. Design of Latch, S-R flip flop, D flip flop
10. Design of Memory circuits

EC 473 COMMUNICATION SYSTEM LAB (0-0-3)

List of experiments:

1. Identification of different components of an optical fiber link and study of their behaviors.
2. Measurement of pulse dispersion in an optical waveguide and measurement of numerical aperture.
3. Performance analysis of an Optical fiber analog and digital link.
4. Measurement of various losses in an optical fiber.
5. Design and simulation of an antenna with given specification.
6. Design and simulation of TDM and WDM system.
7. Setup and component identification of a microwave test bench and
8. Measurement of frequency and wavelength of a signal passing through the waveguide.
9. Measurement of unknown impedance in a microwave test bench using Smith chart.
10. Study of different component and set up of a satellite communication link.
11. Performance analysis of an audio channel using satellite link.